Submitted to:
US EPA Region 8
Denver, CO

Submitted by:
Atlantic Richfield Company
La Palma, CA
October 2013

1290042

Adit and Portal Investigation Report
2013 Update

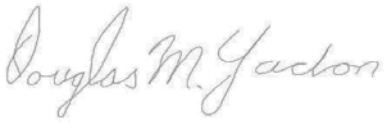
Rico-Argentine Mine Site – Rico Tunnels
Operable Unit OU1
Rico, Colorado

Submitted to:
US EPA Region 8
Denver, CO

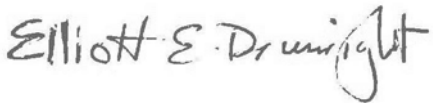
Submitted by:
Atlantic Richfield Company
La Palma, CA
October 2013

Adit and Portal Investigation Report
2013 Update

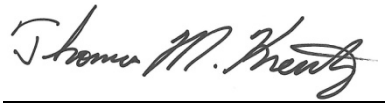
Rico-Argentine Mine Site – Rico Tunnels Operable Unit OU1
Rico, Colorado



Prepared By Douglas M. Yadon, PE
Certifying Engineer



Reviewed By Elliott D. Drumright, PE
Senior Geotechnical Engineer



Released By Thomas M. Kreutz, PE
Project Manager

Atlantic Richfield Company

Atlantic Richfield Company

4 Centerpointe Drive, 4-435
La Palma, CA 90623
Direct: (714) 228-6770
Fax: (714) 228-6749
E-mail: Anthony.Brown@bp.com

October 30, 2013

VIA EMAIL AND HAND DELIVERY

Mr. Steven Way
On-Scene Coordinator
Emergency Response Program (8EPR-SA)
US EPA Region 8
1595 Wynkoop Street
Denver, CO 80202-1129

Subject: Adit and Portal Investigation Report – 2013 Update
Rico Argentine Mine Site – Rico Tunnels Operable Unit OU01 Rico, Colorado

Dear Mr. Way,

A digital file in PDF format of the Adit and Portal Investigation Report – 2013 Update, Rico Argentine Mine Site – Rico Tunnels Operable Unit OU01 Rico, Colorado, dated October 30, 2013, is being submitted to you today via email. Three (3) hard copies of the report will also be hand-delivered to your office no later than close of business November 1.

Atlantic Richfield Company (AR) is submitting this report responsive to requirements in Task D of the Removal Action Work Plan accompanying the Unilateral Administrative Order for Removal Action, Rico-Argentine Site, Dolores County, Colorado, U.S. EPA Region 8, Docket No. CERCLA-08-2011-0005.

Please note that this report presents all relevant investigation results from studies prior to 2013, and those preliminary results from ongoing field investigations that were available as of the date of this submittal. AR proposes to complete the field investigations and laboratory testing this fall, and to compile, interpret and document the 2013 results in a final version of this report to be submitted not later than January 30, 2014.

If you have any questions, please feel free to contact me at (951) 265-4277.

Sincerely,

Anthony R. Brown
Project Manager
Atlantic Richfield Company

cc: Ronald Halsey, Atlantic Richfield Company (via e-mail)
Terry Moore, Atlantic Richfield Company (via e-mail)
Sheila D'Cruz, Atlantic Richfield Company (via e-mail)
Reginald Ilao, Atlantic Richfield Company (via e-mail and hardcopy)
Jan Christner, Weston Solutions, Inc. (via e-mail)
William Duffy, Esq., Davis, Grahm & Stubbs, LLP (via e-mail)
Adam Cohen, Esq., Davis Graham & Stubbs, LLP (via e-mail)
Sandy Riese, EnSci, Inc. (via e-mail)
Tom Kreutz, AECOM Technical Services, Inc. (via e-mail)
Doug Yadon, AECOM Technical Services, Inc. (via e-mail)
Chris Sanchez, Anderson Engineering Company, Inc. (via e-mail)
Kristine Burgess, AEEC, LLC (via e-mail)
Marc Lombardi, AMEC Environment & Infrastructure, Inc. (via e-mail)
Spencer Archer, AMEC Environment & Infrastructure, Inc. (via e-mail)

Contents

List of Appendices

List of Tables

List of Figures

List of Acronyms

AECI	Anderson Engineering Company, Inc.
AIP	Adit Investigation Plan
EPA	Environmental Protection Agency
ER	electrical resistivity
FSP	Field Sampling Plan
HAS	hollow stem auger
PVC	polyvinyl chloride
ReMi	Refraction Microtremor
RQD	Rock quality designation
SLT	St. Louis Tunnel
SPT	Standard Penetration Test
ST	Shelby Tube

1.0 Introduction

1.1 Purpose and scope

This document updates the initial Adit and Portal Investigation Report submitted as Part D of the 2011 Investigations, Analyses and Evaluations report (Atlantic Richfield Company, 2011a) required under Subtask D1 of the Remedial Action Work Plan (RAWP) for the Rico-Argentine Mine Site (EPA, 2011). This updated report documents the work accomplished to date pursuant to the program of site investigations and laboratory testing in the approved original Investigation Plan for Collapsed Adit Area at St. Louis Tunnel (referred to as the Adit Investigation Plan or AIP) (Atlantic Richfield Company, 2011b), the Supplement to the Investigation Plan for Collapsed Adit Area at St. Louis Tunnel (Atlantic Richfield Company, 2012; referred to as the Supplement to the AIP), and the 2013 Supplement to the Investigation Plan for Collapsed Adit Area at St. Louis Tunnel (AECOM, 2013a; referred to as the 2013 Supplement to the AIP). The location of the adit collapse area relative to the St. Louis Ponds site is shown on Figure 1.1.

The primary objectives of the investigations as described in the AIPs were to:

- Investigate the condition of the collapsed portion of the adit and how it interfaces with competent rock at the brow of CHC Hill;
- Assess the possible accumulation of settled solids and water build-up behind the existing blockage in the collapsed area; and
- Provide information to support design of a hydraulic control system for discharges from the St. Louis Tunnel (referred to herein as the SLT).

Investigations to support achieving these objectives are focused on collecting, controlling, and conveying the adit flow from its current point of discharge to the water treatment facility ultimately selected as part of the overall remedy at the Rico Tunnels Operable Unit OU01. It is currently assumed that the discharges will be conveyed to the upgradient end of the demonstration wetlands currently being constructed in the former Pond 19 area (immediately north of Pond 18).

The investigations completed during 2011 and 2012, and results to date from the 2013 investigation program provide the key information necessary to identify appropriate alternatives to advance to 30 percent design, and then support final design of the selected alternative as described in the Preliminary Design Report, St. Louis Tunnel Hydraulic Control Measures (Atlantic Richfield Company, 2013b).

1.2 Organization

Section 1.0 of this report describes the purpose and scope of the investigations performed to meet the objectives of the RAWP and the associated investigation plans. Site reconnaissance and ground surveys are documented in Section 2.0. The locations, methodologies and results of the various field investigation techniques implemented at the site are described in Section 3.0. Section 4.0 presents the results of geotechnical testing performed to date. An interpretation of geologic and geotechnical conditions in the adit collapse area is presented in Section 5.0. References are provided in Section 6.0.

Note that results of geochemical analyses of mine waters encountered during the original field exploration program in 2011 and periodic sampling of borings AT-02 and BAH-01 are included in data previously transmitted to EPA and posted on the project SharePoint site.

2.0 Site Reconnaissance and Ground Surveys

Detailed site reconnaissance of the portion of the St. Louis Tunnel exposed in the U-shaped excavation behind the existing structure at the historic portal location (i.e., the adit collapse area, also referred to as the open, collapsed tunnel reach) was conducted in 2011 and again in 2013. Plans for detailed surveying of key visible features were developed based on the reconnaissance efforts and review of all available, relevant historic information. Targets selected for survey included the tops of timber posts and beams that were key elements of the tunnel support in this reach and that appeared to still be in approximately their original position, and still visible remnants of the original concrete portal structure and railroad bridge abutments immediately behind the portal entrance. Surveys of specific features were conducted utilizing conventional total station equipment and techniques in 2011. In 2013 ground-based LIDAR was utilized to develop 1-foot contours in the study area, as well as to identify the locations and elevations of key features as noted above. Appropriate safety precautions were implemented to protect the survey crews when working near the collapsed tunnel.

The main objective of ground surveys at the adit collapse area was to determine to the extent feasible the dimensions, alignment (i.e., bearing or azimuth) and grade of the visible portion of the tunnel. It was reasoned that this information would provide a check on the tunnel bearing and grade interpreted from published information in McKnight (1974) and unpublished mapping of tunnel geology (Anonymous; date unknown but believed to be circa mid-1950s). The historic and new survey data provided the basis on which a best fit interpretation of portal location, bearing (azimuth) and grade of the St. Louis Tunnel was developed. This interpretation was used to target the initial inclined borings drilled in 2011 and additional inclined borings attempted in 2012 and planned to be drilled in 2013 as discussed in Section 4.0.

Figure 2.1 shows the key data acquired from the 2011 ground survey and an interpreted “best fit” bearing (or azimuth) of the tunnel based on that data. The nominal grade calculated by averaging the top elevations of selected apparently in-place timber posts was 0.9 percent. This is very close to the typical grade constructed in mines of this type and era of about one (1) percent. However, the reliability of this estimate of tunnel grade was judged potentially suspect due to the inherent variability of the ground at the tunnel support post locations (and thus likely variable length of the posts) and the potential that the posts had settled differentially over time under the prior load of colluvium over the tunnel roof. In spite of these uncertainties, drilling of borings AT-02 and BAH-01 in 2011 successfully intercepted the tunnel.

Additional ground survey was performed in 2013, concentrating on spot surveys at the location of the original portal structure (located at and now a portion of the subsequently constructed lime addition structure that is present today). In addition, updated topographic mapping at one-foot contour interval was developed from the ground LIDAR survey. Figure 2.2 provides the updated topographic base mapping developed in 2013. The location and bearing of the tunnel were refined based on the data from the new surveys and the locations at which the tunnel was intercepted by drilling AT-02 and BAH-01 in 2011. The floor grade from the historic tunnel geologic map (found after the drilling in 2011) of approximately 0.3 percent was adopted as the best available information on grade. Note that the approximate locations on the tunnel periphery that were intercepted by AT-2 and BAH-01 were inferred from the drilling data, but are not known with certainty. As a result, the drilling data was not sufficient to check the 0.3 percent grade assumption.

3.0 Field Exploration

3.1 Engineering geologic mapping

A site reconnaissance was performed to identify and map surficial materials (such as fill, alluvium, colluvium, and landslide deposits), and major bedrock units that occur in the vicinity of the overall Rico project site. Prior to the field work, available published geologic mapping and reports were reviewed. The site geologic reconnaissance was performed by traversing the site on foot and mapping key geologic features, exposures and unit contacts on available topographic maps of the site and vicinity. The results of the geologic mapping are discussed in Section 5.0 and shown on Figure 5.1.

3.2 Test pitting

A total of five (5) test pits (TP2011-AT1, -AT-2, -AT-3, -AT-5 and –AT-6) were hand dug in 2011 at the locations shown on Figure 3.1 to acquire representative bulk samples of the colluvium supporting the existing steep and metastable slopes of the excavation in the collapsed adit area. TP2011-AT4 was not dug due to safety issues at its planned location. In addition to acquiring samples for laboratory testing as described in Section 4.1, the in situ density and moisture content of the colluvium was measured utilizing a nuclear density gage at four (4) of the test pit locations (TP2011-AT1, -AT2, -AT5 and -AT6). The results of the field density testing are included in Table 4.1. Note that logs were not developed for these very shallow hand-dug excavations.

Three (3) test pits (TP2013-6, -7 and -8) were excavated with a tracked excavator to depths ranging from 7.0 to 18.5 feet at the locations shown on Figure 3.1 (at the entrance to the terrain trap, adjacent to the open, collapsed reach of the SLT, and in the colluvium in the adjacent slope to the south). The primary objective of these test pits was to provide bulk samples of the colluvium for additional geotechnical testing as described in Section 4.1. Logs and photographs of the test pits are provided in Appendix A and the results of geotechnical testing are included in Table 4.1.

3.3 Drilling

Boreholes were drilled to investigate subsurface stratigraphy, geotechnical properties, and groundwater conditions, and to collect samples for geotechnical laboratory testing, at targeted locations within and adjacent to the open, collapsed reach of the SLT and terrain trap. The boreholes were drilled to the target depths (or refusal if shallower) specified in the original AIP, Supplement to AIP, or 2013 Supplement to the AIP and logged by a professional geotechnical engineer or geologist in general accordance with the guidelines in the Engineering Geology Field Manual (US Bureau of Reclamation, 2001). The logs include information on the following:

- Drilling equipment used
- Difficult or problematic conditions
- Depth of changes in horizons or materials encountered, including color, gradation, soil classification, plasticity, density and moisture
- Other features such as roots, debris, fissures, voids, staining, etc.
- If encountered, the depth to perched or water table groundwater

3.3.1 Drilling equipment and methods

A variety of drilling equipment and methods have been utilized at the site over the past three field seasons in an effort to accommodate the challenging drilling conditions inherent to the colluvial and

alluvial deposits present. The equipment and methods used each season are briefly described as follows.

2011:

- Boart-Longyear C-100 - “Minis Sonic” tracked sonic drill rig used for vertical sonic drilling in restricted access locations
- Boart-Longyear 600 C – Standard-size tracked sonic drill rig used for vertical sonic drilling in typical access locations and Standard Penetration Test (SPT) and Shelby Tube sampling
- Longyear 45: Skid-mounted core drilling rig used for angled borings advanced using direct mud rotary drilling and casing advance

2012:

- AMS Compact Roto-Sonic 10-C - Light-duty small-tracked sonic rig with 2-inch barrel used for angled sonic and mud rotary drilling, and SPT and Shelby Tube sampling (if applicable) in typical surficial deposits on site; used in restricted access locations as needed
- Ditch Witch JT860 and Symmetrix System - Small, track-mounted rotary drill rig used for angled air rotary drilling, advancing casing with the Symmetrix casing-advance system
- Central Mining Equipment 85 - Large truck-mounted, rotary drill rig used for hollow stem auger (HSA) drilling through typical colluvium and alluvium and mud-rotary drilling (if needed) through cobbles and boulders, with SPT testing and sampling

3.3.2 2011 drilling results

Two drill holes (AT-2 and BAH-01) were completed in 2011 as part of the initial investigations at the adit collapse area. Copies of the boring logs for AT-2 and BAH-01 are included in Appendix A. Detailed narratives of the methods used and conditions encountered in drilling AT-2 and BAH-01 are included in Atlantic Richfield Company (2011a, Part A), and summarized as follows.

AT-2. Drill hole AT-2 was originally planned to be drilled using an air-track rig and the designation of “AT” was retained when the decision was made to drill with a direct mud rotary coring rig instead. The final location selected for this drill hole was in the vicinity of the originally planned AT-2; there was not a drill hole attempted at the AT-1 or other locations envisioned in Atlantic Richfield Company (2011b) due to safety concerns working in the terrain trap. A drilling platform approximately 20 feet by 40 feet was constructed and concrete blocks were stacked on the up-slope side of the platform to prevent rocks rolling down the terrain trap slopes from impacting the drilling platform. A skid-mounted Longyear 45 core drilling rig was positioned on the drilling platform and the drill stem oriented to intersect the St. Louis Tunnel based on the best location information available at that time. Drill hole AT-2 was drilled between October 18 and 21, 2011.

The hole was advanced through colluvium and into the tunnel by mud rotary drilling and advancing HWT casing. At the angle penetrated, the tunnel void was approximately 8.5 feet long. An attempt was made to core into the ground beyond the tunnel with HQ wireline tooling. Steel and wood were encountered that were interpreted as a tie and rail. Once cleared, a further attempt was made to core past the tunnel. It is believed that the hole terminated approximately 7 feet into colluvium beyond the tunnel. The hole was completed with nominal 4-inch diameter HWT casing penetrating into the tunnel. Water level in the tunnel was measured and samples of tunnel water and accumulated settled sludge (“red dog”) were sampled through the casing.

BAH-01. Boring BAH-01 was drilled to investigate the thickness of the colluvial material and location of the buried bedrock surface in the vicinity of the St. Louis Tunnel alignment. The boring was oriented to attempt to intercept the St. Louis Tunnel. The location of BAH-01 and orientation of the borehole in

relation to the St. Louis Tunnel alignment are illustrated on Figure 3.1. Drilling was accomplished using the same skid mounted Longyear 44 diamond core rig as for AT-2. The hole was advanced through the colluvium using rotary wash methods. Drilling commenced on October 26 and was completed on November 9, 2011.

Drilling conditions in the colluvium from ground surface to 210 feet (inclined boring length) were very difficult. The difficulties can be attributed to the fact that the colluvium encountered in the borehole was unstable in that portions of uncased hole would typically cave if the drill stem would have to be pulled back from the bottom of the hole for any reason. Another challenge for completion of the borehole was the fact that the colluvium contained blocks of hard bedrock that were very difficult to penetrate to set casing to stabilize the hole. The colluvium was also relatively loose such that larger blocks of bedrock encountered in the colluvium tended to move during drilling and sometimes bind the drill stem. The thickness of the colluvium was unknown prior to drilling. For this reason, careful sampling of the larger bedrock blocks using diamond coring was necessary to determine if the borehole was penetrating intact bedrock or larger blocks of detached bedrock within the colluvium. In addition, installation of casing using a casing shoe (that was required from 147 to 210 feet) could not be accomplished through harder bedrock blocks unless these blocks were predrilled using a diamond core bit and core barrel. The borehole was completed by installing steel casing through the colluvium and into the surface of the bedrock. The casing includes: 1) a larger casing (HWT casing) that extends from the surface to 186 feet; and 2) a smaller casing (HQ rods) that extends from the surface to 210 feet. Both sets of casing were left in the completed boring so that the hole would remain open and accessible for future surveys and sampling as necessary.

Bedrock was encountered between 210 and 240 feet in the boring. The bedrock was sampled by continuous coring. A void zone was encountered between 240 and 252 feet where the boring was terminated. The void was identified by the fact that the drill stem could be advanced by pushing the rods without rotation. When the void was encountered it was suspected to be the St. Louis Tunnel and the rods were pushed for 12 feet in an attempt to determine if drilling could be resumed on the far side of the tunnel. However, bedrock was not encountered within the 12 foot zone suggesting that the drill stem was following the wall of the tunnel rather than penetrating rock on the back (north) side of the tunnel.

After the void was encountered the drill stem was extended approximately five (5) feet into the void and drill fluid was pumped down the drill stem for several minutes in an effort to agitate sediment or precipitate that was thought may be present in the tunnel so that a color change could possibly be detected where the flow from the St. Louis Tunnel daylights in the tunnel collapse reach shown on Figures 5.1 and 5.2. Thirty three minutes after drilling fluids were initially pumped into the tunnel a distinct red color change was noted in the St. Louis Tunnel discharge.

3.3.3 2012 drilling results

A total of five (5) borings were drilled at the locations shown on Figure 3.1 during the 2012 field season. The drilling method used and results obtained for each of these borings are described below. Standard 2-inch nominal Schedule 40 PVC open tube wells were installed in selected borings as noted below, utilizing 0.010-inch machine-slotted screen with silica sand pack or pre-pack screens (as noted on the logs). Boreholes not completed as monitoring wells were backfilled using a fluid cement/bentonite grout unless otherwise noted on the logs. Logs for these borings are provided in Appendix A.

MW-202. Boring MW-202 was completed within the terrain trap near boring AT-2. This boring was advanced using the sonic drilling method. MW-202 encountered 2 feet of sandy and silty gravel fill at the surface, followed by layered sandy gravel colluvium with variable silt and clay content to the maximum depth of exploration (38.8 feet). Selected intervals of the sonic core recovered were saved as bulk samples for laboratory testing as described in Section 4.0. A 10-foot-long well screen with sand

pack was placed at the bottom of the hole, and then the remainder of the hole was backfilled with a grout seal.

MW-204. Boring MW-204 was drilled at the west end of the open, collapsed portion of the SLT utilizing the sonic drilling equipment. MW-204 encountered mostly sandy gravel colluvium with variable silt and clay content from the surface to the maximum depth of exploration (31.5 feet). A 15-foot long well screen and sand pack were set at the bottom of the hole, followed by a grout seal to the ground surface. Selected intervals of the sonic core recovered were saved as bulk samples for laboratory testing as described in Section 4.2.

CHV-101S. Boring CHV-101S was drilled on the north side of the open, collapsed portion of the SLT, between MW-202 and MW-204. This boring was advanced using the HSA drilling technique with SPTs performed in situ on approximately 2.5-foot intervals to 30 feet, with a final SPT taken at 45 feet. SPT samples were recovered for laboratory testing as discussed in Section 4.2. Loose, clayey sand fill was encountered from grade to 7.5 feet, followed by mostly silty and clayey sand and gravel colluvium (medium-dense increasing to extremely dense) to refusal on boulders at 29.0 feet. The boring was then offset 6 feet east, blank drilled to 30 feet, then advanced through layered gravel, cobbles, and boulders, again to refusal at 48 feet. It was then decided to terminate the boring, and complete it as an open tube monitoring well with a 10-foot-long well screen and sand pack at the bottom, with a grout seal to the ground surface.

CHI-102 and -102B. Boring CHI-102 was intended to be completed as an angle boring through the colluvium to intercept intact bedrock in the SLT east of the colluvial reach of the tunnel. The boring was drilled from a prepared drilling pad approximately 175 feet north of the tunnel. The boring was completed with compressed air as the drilling fluid, using a down-hole hammer/casing assembly. From the surface, and on an initial 22.2 degree down-angle, silty gravel and sand was observed in the cuttings to 5 feet, followed by silty sand with sandstone and shale fragments to 23 feet. From 23 to 38 feet, silt with fragments of altered sandstone was observed. At 38 feet, the welded casing shoe broke off of the casing and the hole was terminated. The casing was left in place.

Boring CHI-102B was a second attempt at the same target as for CHI-102, and was offset 2 feet to the east. The boring extended to 65 feet (at a similar down angle of 21.4 degrees). In a matrix of sandy silt colluvium, fine-grained sandstone chips were observed to 47.5 feet, followed by a boulder from 47.5 to 51.5 feet. From 51.5 to 65 feet, sandstone, quartz, and pyrite fragments were observed in a matrix of sandy silt colluvium. A similar casing/casing shoe problem occurred and the boring was terminated at 65 feet. The casing was left in place.

3.3.4 2013 drilling results

A total of five (5) primary vertical borings were completed during the 2013 field season (MW-201, -203, -205, -207 and CHV-101D). Two (2) additional borings (CHV-101M and -101U) were drilled immediately adjacent to CHV-101D to install monitoring wells with screens in perched aquifers encountered during the drilling of CHV-101D. The locations of these borings are shown on Figure 3.1 and logs are included in Appendix A.

MW-206. One additional vertical boring (MW-206) was originally planned as noted in the 2013 Supplement to the AIP. A decision was made to delete MW-206 from the 2013 field investigation program given the successful results from the other 2013 borings completed, the results of the nearby 2013 surface geophysical profiling (see Section 3.5), and information acquired from other drilling in the vicinity during prior field investigations.

CHI-101 and -102C. Two (2) inclined borings (CHI-101 and -102C), and possibly a third inclined boring (CHI-103) pending results of the first two borings, were originally planned as described in the 2013 Supplement to the AIP. These borings were primarily intended to supplement information within the

rock portion of the existing SLT acquired from boring BAH-01 in 2011 to support a hydraulic control measures alternative involving tunneling or large-diameter horizontal drilling to rock. Boring CHI-101 was drilled to 113 feet, encountering the same extremely challenging drilling conditions in the colluvium as found in BAH-01, CHI-102 and CHI-102B. The planned start of drilling of boring CHI-102C was delayed due to weather-induced instability found in the access road and drill pad on the north side of the terrain trap prior to mobilizing the drill rig to that location. Given the recommendation in the Preliminary Design Report, St. Louis Tunnel Hydraulic Control Measures (subsequent to submittal of the 2013 Supplement to the AIP) to proceed with an alternative for hydraulic control measures that does not involve tunneling or horizontal boring, and with weather conditions deteriorating and safety concerns rising, a decision was made to terminate boring CHI-101 at 113 feet, and not to drill boring CHI-102C (or CHI-103) during the 2013 field season.

3.4 Downhole geophysical logging

All five (5) of the borings completed during the 2013 field investigation and two borings completed in 2012 (MW-202 and -204) were logged with a suite of downhole geophysical tools after the drilling and well installation were completed. The tools utilized included borehole video (for casing assessment), and natural gamma, conductivity, and thermal neutron (for stratigraphy, lithology and saturation).

The downhole geophysical logging was performed by the COLOG Division of Layne Christensen between October 22 and 24, 2013. The downhole logging was performed by lowering the selected tool down the PVC casing within the borehole by a multi-conductor cable connected to a motorized winch. The data collected during the survey was transmitted to a computer and graphical display and reviewed by the geophysical-logging specialist in real time. This allowed for the geophysical-logging specialist to verify that the tools were operating as expected and make appropriate adjustments to the surveys as necessary to meet the data collection objectives.

3.5 Surface geophysical profiling

Surface geophysical profiling was performed by GEI Consultants, Inc. as part of the 2013 field investigation program utilizing two complementary techniques to supplement the results of borings and test pits. The techniques employed were refraction microtremor (ReMi) and electrical resistivity (ER). Each of these techniques is discussed in the following subsections.

3.5.1 Refraction microtremor

ReMi profiles record ambient vibrations from nearby sources such as moving vehicles and equipment that result in shear and compression wave returns from subsurface materials to a linear array of geophones placed on the ground surface along the profile to be explored. These returns are assembled into a response spectrum that is analyzed by computer to evaluate shear and compression wave velocities (and thereby an index of density) of overburden materials and the approximate depth to interfaces of materials of varying density (e.g., competent strata such as intact bedrock).

A series of geophones were placed on the ground in arrays at a spacing appropriate to the depth of exploration desired. Where multiple spreads were performed to create a long line, the last several geophones were left in place and utilized to create overlap between adjacent spreads. This overlap is necessary to fill in data gaps near profile edges when creating continuous two-dimensional sections on longer lines. Once collected, the data were checked for their fidelity. To assure that a robust profile was being made, both individual recordings and multiple summed (stacked) recordings were evaluated.

A wave field transformation data processing technique and an interactive Rayleigh-wave dispersion modeling tool were employed for the spectral analysis of surface waves. By analyzing segments of the geophysical line and integrating the results, two-dimensional profiles were developed along the seismic

line arrays. The purpose of the two-dimensional profiles was to provide details of the shear wave velocities along the array length to the greatest depths possible.

A total of seven lines of seismic data were collected for ReMi processing from September 25 through October 1, 2013. The locations of these lines as surveyed by Anderson Engineering Company, Inc (AECI) are shown on Figure 3.1. RM-201 through RM-204 were aligned to provide overall areal coverage of the colluvium and alluvium overlying bedrock at some depth at and in the vicinity of the collapsed adit and terrain trap. These alignments were constrained to avoid excessively steep slopes that complicate the interpretation of the field data. The three shorter ReMi lines (RM-205A, -205B, and -205C) located within the terrain trap were aligned to attempt to locate the St. Louis Tunnel and supplement the locations confirmed to date at AT-2 and BAH-01. The results of the ReMi profiling are presented in Appendix A.

3.5.2 Electrical resistivity

Where conditions are susceptible, ER profiling can be used to image unconsolidated sediments/layering, groundwater interfaces of sufficiently contrasting electrical conductivity (due to dissolved mineral chemistry), near-surface geologic stratigraphy, and air/water-filled and clay-filled voids. These features represent zones of variable electrical conductivity, and by mapping the flow of electrical current throughout the subsurface, it is possible to image the lateral and vertical distribution of these features. The objectives of the ER profiling at the open, collapsed reach of the SLT and adjacent ground were to: 1) further characterize the nature and stratigraphy of the colluvium and alluvium underlying the area; 2) identify the approximate depth to saturation within the colluvium (whether due to perched or water table conditions); and 3) to the extent feasible, assess the presence of partial saturation that might indicate water exiting the SLT and seeping into the colluvium.

ER profiling was performed by transmitting a very low amperage direct current (DC) electrical current into the subsurface between stainless steel electrodes spaced equally along a profile. The subsurface current flow was mapped by measuring the electrical potential at the ground surface using a high-sensitivity resistivity meter. Resistivity profiles were positioned for the greatest allowable profile length to facilitate depth of investigation and desired resolution. The longest single profile utilized a10-foot electrode spacing; a 5-foot electrode spacing was used on the shorter lines. A maximum exploration depth of approximately 45 to100 feet was targeted using these electrode array lengths. Elevation changes over the length of the deployed resistivity array were picked from the location surveys and existing 1-foot contour topographic mapping and used in the data reduction process.

Four lines of ER profiling (RS-201, RS-202, RS-203, and RS-204) were performed in and adjacent to the open, collapsed reach of the SLT from September 25 through October 1, 2013. As shown on Figure 3.1, these lines were located adjacent to the ReMi lines. The results of the ER profiling are presented in Appendix A.

3.6 Groundwater level monitoring

All of the borings completed as monitoring wells were developed by bailing or surging to clear the well casing and screen of drilling fluid and settled cuttings. Water levels are periodically monitored in accordance with the requirements in the Sampling and Analysis Plan for Surface Water and Groundwater (Atlantic Richfield Company, 2013c). Groundwater level readings to date are presented in Table 3.1.

4.0 Geotechnical Laboratory Testing

4.1 Test methods and results - 2011

Bulk samples acquired from the hand dug test pits described in Section 3.2 were tested for gradation, plasticity (Atterberg limits) and laboratory moisture/density relationship (i.e., Proctor density). The results of the laboratory testing are included in Table 4.1; laboratory data sheets for this testing are provided in Appendix B. The results of the field density/moisture content testing are included with the laboratory testing results in Table 4.1 and in Appendix A.

Three (3) of the samples tested classify as non-plastic to very low plasticity silty gravel with sand; one sample tested as low plasticity clayey gravel with sand; and the other sample was slighty plastic silty, clayey sand with gravel. The percent fines of the minus 3 to 4 inch fraction of these samples ranged from 13 to 23 percent, averaging 19 percent. Corrected maximum dry density of these samples ranged from 127.2 to 138.0 pcf with optimum moisture contents ranging from 7.6 to 9.3 percent. The in situ density and moisture content from nuclear gage testing ranged from 97.5 to 118.0 pcf and 11.7 to 15.8 percent, respectively. Based on these laboratory moisture-density (i.e., Proctor) test and nuclear gage in situ density results, the near surface colluvium forming the steep excavation slopes in the terrain trap is loose to very loose (relative compaction in the range of only 73-88 percent).

One additional sample from the terrain trap slopes (identified as “St. Louis Adit/cut above adit”) was acquired sometime before 2011 and tested for gradation and Proctor density. This sample classified as sandy gravel with only 8 percent fines. The maximum dry density and optimum moisture content of this sample were 133.3 pcf and 7.5 percent, respectively, similar to the 2011 results noted above.

4.2 Test methods and results – 2012

Bulk samples acquired from sonic drilling samples (borings MW-202 and MW-204), and soils recovered from SPTs taken in boring CHV-101S were tested for gradation and plasticity. The results of the laboratory testing are included in Table 4.1; laboratory data sheets for this testing are provided in Appendix B.

The moisture content of the near-surface fill ranged from 12 to 18 percent; and in the underlying native colluvium generally 8 to 18 percent (up to 36 percent at 25 feet depth in MW-202). Samples of the smaller gravel (i.e., ¾-1 inch minus) through fines fraction of the colluvium recovered from Standard Penetration Tests (SPT) in CHV-101S and sonic cores from two other borings (MW-202 and MW-204) classify as non- to very slightly plastic, silty to locally very slightly clayey sand and gravel. Fines in these samples ranged from 2.6 to 29.6 percent, with an average of 13.7 percent (and only 2 of 17 samples less than about 8 percent).

5.0 Site Characterization

This section of the report describes the condition of the St. Louis Tunnel, the local geologic setting, the characteristics of the geologic units present, and groundwater conditions in the area relevant to the hydraulic control measures under consideration as documented in the Preliminary Design Report, St. Louis Tunnel Hydraulic Control Measures (Atlantic Richfield Company, 2013b).

5.1 St. Louis tunnel

The investigations documented in this report focused on the portion of the SLT that was originally driven through approximately 330 feet of colluvium at the base of CHC Hill, and then into bedrock of the Hermosa Formation to just beyond the reach that was reportedly lagged (i.e., approximately 35 feet into the rock from the contact with colluvium). Based on archival tunnel geologic mapping and historic photographs, it is inferred that the tunnel is nominally seven (7) feet high and nine (9) feet wide. It is important to note, however, that these are nominal dimensions and the actual width and especially the height could vary significantly (up to at least a foot or more depending on over-breaks, support installation, and possible local over-excavations).

Available aerial photographs show that a major excavation was made over the downgradient reach of the SLT sometime between August 1950 and October 1952. It is speculated that this was to reduce the overburden stress on the timber supports in the colluvial section of the tunnel and reduce what was likely a frequent need to repair or replace support (based on anecdotal discussion in McKnight, 1974). The resultant steeply sloping U-shaped excavation is now referred to as the “terrain trap”. The slopes in this area are excessively steep and judged at best metastable to unstable near surface at their angle of repose. Cobble- and boulder-size rocks roll and tumble down these slopes, especially following rainfall and snowmelt events. Finer (sand and gravel fraction) colluvium also continues to be transported down slope by gravity, accumulating at the toes of the slopes. It has been observed that approximately 2-4 feet of colluvial debris (including cobbles and boulders) have accumulated behind a 4-foot high “jersey barrier” wall placed in the terrain trap in October 2011.

Review of subsequent aerial photography is interpreted to show that the remaining ground over this reach of the tunnel remained relatively undisturbed until at least August 1989, except that raveling of the slopes removed the benches visible shortly after the initial excavation. An informal discussion with one of the Anaconda Minerals Company mining engineers as reported by Sandy Riese (Personal communication, 2013) confirmed that the portion of the tunnel through the colluvial section was in good condition with adequate timber support as late as approximately 1985. Sometime later, inferred by review of available aerial photography as before September 1998, it appears that someone borrowed the remaining colluvial cover over the first approximately 250 feet of the tunnel in-by the original portal location. In this reach, the back (i.e., the roof) of the tunnel is now mostly gone and the tunnel is partially filled with damaged and displaced timber supports and what is assumed to be displaced colluvium ranging from silty sand to cobbles and boulders. The upper end of the now “open, collapsed” portion of the tunnel is blocked by a boulder at least seven (7) feet in visible dimension and water currently begins emerging at the surface at this point. It is inferred that the next approximately 60 feet of the tunnel upgradient in the colluvial section is at least partially plugged with displaced colluvium and broken timber supports. This inference is based primarily on the observation that boring AT-2 appears to have penetrated the tunnel in a relatively open reach, but encountered water filling the tunnel to the back. Without a leaky blockage, the average tunnel flows would be on the order of well less than a foot deep above the tunnel floor. This reach, estimated to be up to approximately 70 feet long, is referred to as the “debris plug”. It is not known if there is additional debris plugging some or all of the remaining

approximately 60 feet of the tunnel in the colluvial reach to the contact with Hermosa Formation bedrock.

5.2 Site geology

An interpretation of the geologic conditions in the vicinity of the St. Louis Tunnel portal and adit collapse area is shown in plan on Figure 5.1 and in profile along the St. Louis tunnel centerline on Figure 5.2. This interpretation is based on surface geologic mapping of the slope conditions located upslope and in the vicinity of the tunnel alignment and the results of the exploratory drilling, test pitting, and surface geophysical surveying completed to date (see Figure 3.1 for locations of exploratory features). An exposure of bedrock consisting of the Lower Hermosa Formation was mapped several hundred feet upslope of the tunnel portal area. The bedrock in this exposure consists of a bedded sequence of sandstone and siltstone defined by both outcrops and subcrops (areas where the material has broken off or is derived from in-place outcrops but probably not moved more than a few feet from its original location) and therefore marks the approximate location of intact bedrock at the ground surface above the tunnel.

There is also a small localized active landslide located in the slope above the collapsed tunnel entrance area. The surface expression of the slide suggests that it is shallow (<10 feet) and has not moved in the past several years. The reminder of the area located above and adjacent to the adit collapse area is covered by coarse colluvial material containing abundant boulder size blocks of displaced bedrock. As seen on Figure 5.1, the colluvium is locally covered to the north of the adit collapse area (northwest of the terrain trap) by the Soil Lead Repository constructed in 2009.

5.3 Geologic units

5.3.1 Colluvium

The colluvium in the vicinity of the collapsed and debris-plugged reach of the SLT is described as a heterogeneous mixture of relatively loose soil and rock ranging from predominantly non- to occasionally very slightly plastic fines (finer than the USCS No. 200 sieve), to “boulders” (typically subangular blocks of sedimentary Hermosa Formation and intrusive igneous rock) at least as large as 20 feet where visible and encountered in borings to date.

5.3.2 Bedrock

Where encountered in boring BAH-01 at and just beyond the contact with colluvium, the bedrock is comprised of Hermosa Formation. In this reach, the Hermosa Formation is characterized by interbedded, fine-grained, medium greenish gray sandstone and medium dark gray siltstone that is hydrothermally altered and mineralized with finely disseminated pyrite. The approximately 25 feet of rock cored is typically moderately hard, weak to at most moderately strong, and closely fractured. Locally the bedrock sequence is cut by shear zones where the rock is closely to intensely fractured and contains clay gouge (i.e., fault gouge). A prominent quartz vein several inches thick and pockets of pyrite and quartz were also encountered. Core recovery in this reach ranged from 20 to 100 percent, averaging about 66 percent. Rock quality designation (RQD) was zero except for one 5-foot run with an RQD of 38 percent. Based on archival geologic mapping of the SLT, it appears that the quality of the bedrock likely improves approximately 35 feet beyond the colluvial contact where lagging and prominent mineralized veins are indicated as ending and “massive sandstone” is encountered.

6.0 References

Atlantic Richfield Company. 2011a. *Investigations, Analyses and Evaluations (Part A - Engineering Geologic and Geotechnical Field Investigations and Laboratory Testing, Part D – Adit and Portal Investigation Report). Rico-Argentine Mine Site – Rico Tunnels Operable Unit OU01, Rico, Colorado*; submitted to US EPA, Region 8, Denver, CO. December 30.

Atlantic Richfield Company. 2011b. *Investigation Plan for Collapsed Adit Area at St. Louis Tunnel, Rico-Argentine Mine Site – Rico Tunnels Operable Unit OU01, Rico, Colorado*; submitted to US EPA, Region 8, Denver, CO. August 29.

Atlantic Richfield Company. 2012. *Supplement to Investigation Plan for Collapsed Adit Area at St. Louis Tunnel, Rico-Argentine Mine Site – Rico Tunnels Operable Unit OU01, Rico, Colorado*; submitted to US EPA, Region 8, Denver, CO. July 3.

Atlantic Richfield Company. 2013a. *Supplement to Investigation Plan for Collapsed Adit Area at St. Louis Tunnel, Rico-Argentine Mine Site – Rico Tunnels Operable Unit OU01, Rico, Colorado*; submitted to US EPA, Region 8, Denver, CO. May 31.

Atlantic Richfield Company. 2013b. *Preliminary Design Report, St. Louis Tunnel Hydraulic Control Measures, Rico Argentine Mine Site, Rico Tunnels Operable Unit OU01, Rico, Colorado*. October 30.

McKnight, E.T. 1974. *Geology and Ore Deposits of the Rico District, Colorado*: U.S. Geological Survey Professional Paper No. 723.

U.S. Bureau of Reclamation. 2001. *Engineering Geology Field Manual, Second Edition, Volume II;* U.S. Department of the Interior, Bureau of Reclamation.

U.S. Environmental Protection Agency (EPA). 2011b. *Removal Action Work Plan. Rico-Argentine Mine Site – Rico Tunnels Operable Unit OU01, Rico, Colorado*. March 9.

Tables

Table 3.1: Groundwater Elevations

Well Completion Data / Date Measured	Location												
	AT-2	*BAH-01*	*CHV-101D*	*CHV-101M*	*CHV-101S*	*CHV-101U*	*MW-201*	*MW-202*	*MW-203*	*MW-204*	*MW-205*	*MW-206*	*MW-207*
Top Casing Elevation	8,866.2	8,912.6			8,858.9			8,859.2		8,866.0			
Bottom of Casing Elevation													
Measuring Point (MP) Elevation													
Top of Screen Elevation													
Bottom of Screen Elevation													
11/27/2012					8,822.4			DRY		8,852.1			
12/18/2012								8,824.2					
1/4/2013										8,851.6			
1/24/2013								DRY		8,851.0			
2/7/2013										8,851.3			
2/8/2013	8,859.9												
3/13/2013	8,860.0									8,850.5			
4/3/2013	8,854.4									8,850.6			
4/24/2013								8,825.6					
5/16/2013										8,850.5			
5/21/2013													
5/22/2013	8,859.4				8,810.9			8,824.5					
6/12/2013	8,859.7				8,822.7			8,824.6					
6/13/2013										8,850.4			
7/19/2013	8,859.8				8,821.7			8,826.8		8,850.6			

Notes
All blank entries represent no data collected on that day
All readings in feet above mean sea level

Table 4.1: Geotechnical Laboratory Testing Results

Sample Location/Type			Index Properties			Gradation			Atterberg Limits		Laboratory Compaction		Field Compaction			Direct Shear Strength		Soil Classification		
Boring/ Test Pit	Depth (ft)	Type[1]	Natural Moisture Content (%)	Dry Unit Weight (pcf)	Specific Gravity	Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL (%)	PI (%)	MDD[2] (pcf)	OMC[2] (%)	DD (pcf)	MC (%)	Compaction (%)	ϕ' (°)	c' (psf)	Field Classification	Lab Classification	Lab Description
AT-2	No Samples Aquired																			
BAH-01	No Samples Aquired																			
CHV-101D	Testing In Progress																			
CHV-101S	2.5-4	SS	12.5	-	-	24	46.4	29.6	-	-	-	-				-	-	SC	-	
CHV-101S	5-6.5	SS	11.9	-	-	-	-	-	-	-	-	-				-	-	SC	-	
CHV-101S	7.5-9	SS	7.9	-	-	-	-	13.8	-	-	-	-				-	-	SM-GM	-	
CHV-101S	10-11.5	SS	8.8	-	-	-	-	-	-	-	-	-				-	-	SM-GM	-	
CHV-101S	12.5-14	SS	14.9	-	-	40	42.6	17.4	NV	NP	-	-				-	-	SC	-	
CHV-101S	15-16.5	SS	14.8	-	-	-	-	-	-	-	-	-				-	-	SC	-	
CHV-101S	17.5-19	SS	12	-	-	-	-	-	NV	NP	-	-				-	-	SC	-	
CHV-101S	20-21.5	SS	12.9	-	-	-	-	-	-	-	-	-				-	-	CL	-	
CHV-101S	22.5-23.5	SS	15.9	-	-	-	-	-	NV	NP	-	-				-	-	GC	-	
CHV-101S	27.5-29	SS	9.8	-	-	-	-	14	-	-	-	-				-	-	GM	-	
CHV-101S	30-31.5	SS	11.8	-	-	-	-	-	-	-	-	-				-	-	GC	-	
CHV-101S	45-46.5	SS	10.3	-	-	-	-	15.3	-	-	-	-				-	-	SC	-	
EW-1																				
EW-2A																				
MW-201	Testing In Progress																			
MW-202	0-1.5	SONIC	19	-	-	57	30	13	NV	NP	-	-				-	-	GM	-	
MW-202	1.5-6	SONIC	20	-	2.65	35	40	25	30	21	128	9				-	-	SC	-	Clayey Gravel With Sand
MW-202	6-9	SONIC	14.1	-	-	-	-	-	-	-	-	-				-	-	GW-GC	-	
MW-202	9-12	SONIC	18.2	-	-	-	-	-	-	-	-	-				-	-	SC	-	
MW-202	12-18	SONIC	24	-	2.65	20	70.7	9.3	30	21	125.1	10.4				-	-	SW-SM	-	Poorly graded Sand with Clay and Gravel
MW-202	18-23	SONIC	13.1	-	2.65	20	70.7	9.3	30	21	125.1	10.4				-	-	SW-SM	-	Poorly graded Sand with Clay and Gravel
MW-202	23-30	SONIC	36	-	2.65	20	70.7	9.3	30	21	125.1	10.4				-	-	SW-SM	-	Poorly graded Sand with Clay and Gravel
MW-202	30-35.5	SONIC	9.7	-	-	-	-	-	-	-	-	-				-	-	SW-SM	-	
MW-203	Testing In Progress																			
MW-204	0-7	SONIC	7.9	-	2.65	74	23	3	-	-	125.9	9.9				-	-	GW	-	
MW-204	7-10.5	SONIC	9.7	-	2.65	-	-	-	29	10	125.9	9.9				-	-	GW-GC	-	
MW-204	10.5-12	SONIC	9.4	-	2.65	67	30.4	2.6	-	-	125.9	9.9				-	-	GW	-	
MW-204	12-15	SONIC	14.4	-	2.65	-	-	-	29	10	125.9	9.9				-	-	GW-GC	-	
MW-204	21-25.5	SONIC	16.6	-	2.65	54	38.4	7.6	-	-	125.9	9.9				-	-	GW-GM	-	
MW-205	Testing In Progress																			
MW-206	Testing In Progress																			
MW-207	Testing In Progress																			
SSR-103																				
St. Louis Adit	ut Above Ac	BULK	-	-	-	49	43	8	-	-	133.3	7.5				-	-	-	-	
TP-2004A																				
TP-2004B																				
TP2011-AT1	0-2	BULK	-	-	2.65	32	45	23	24	6	127.2	9.2	97.5	12.8	77	-	-	-	SC-SM	Silty Clayey Sand With Gravel
TP2011-AT2	0-2	BULK	-	-	2.65	46	37	17	21	NP	138	7.6	100.8	11.7	73	-	-	-	GM	Silty Gravel With Sand
TP2011-AT3	0-2	BULK	-	-	2.65	49	38	13	-	-	135.6	8.2				-	-	-	GM	Silty Gravel With Sand
TP2011-AT4	No Samples Aquired																			
TP2011-AT5	0-2	BULK	-	-	2.65	50	31	19	35	8	133.4	8.4	118.0	15.8	88	-	-	-	GM	Silty Gravel With Sand
TP2011-AT6	0-2	BULK	-	-	2.65	40	38	22	32	11	130.1	9.3	109.3	14.8	84	-	-	-	GC	Clayey Gravel With Sand
TP2011-17																				
TP-17																				
TP-18																				
TP-22																				
TP2013-6	Testing In Progress																			

Table 4.1: Geotechnical Laboratory Testing Results

Sample Location/Type			Index Properties			Gradation			Atterberg Limits		Laboratory Compaction		Field Compaction			Direct Shear Strength		Soil Classification		
Boring/ Test Pit	Depth (ft)	Type[1]	Natural Moisture Content (%)	Dry Unit Weight (pcf)	Specific Gravity	Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL (%)	PI (%)	MDD[2] (pcf)	OMC[2] (%)	DD (pcf)	MC (%)	Compaction (%)	ϕ' (°)	c' (psf)	Field Classification	Lab Classification	Lab Description
TP2013-7	Testing In Progress																			
TP2013-8	Testing In Progress																			

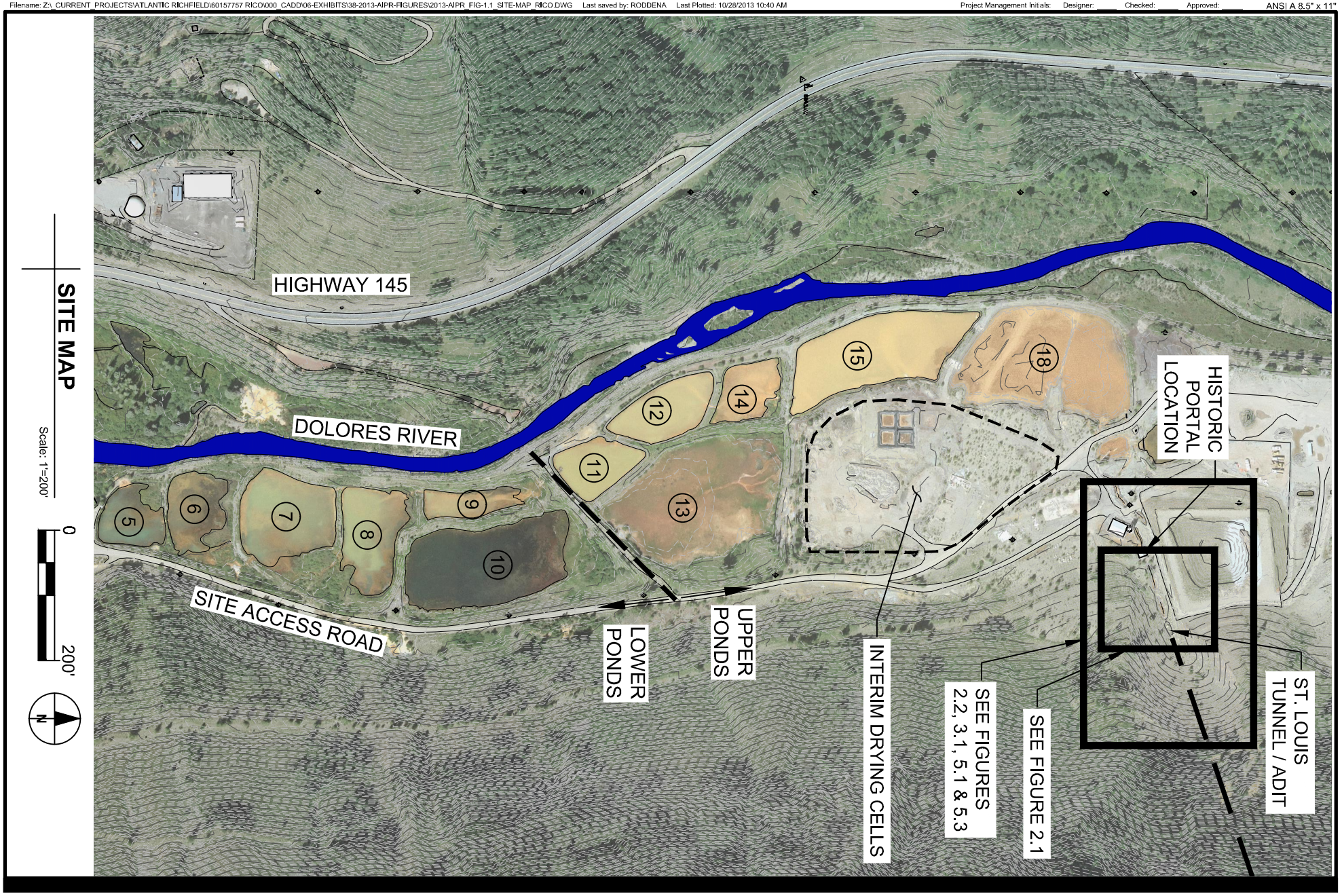
Notes:

[1]SS - Split spoon; SONIC - Sonic core; BULK - Composite grab sample

[2]Maximum Dry Density (MDD) and Optimum Moisture Content (OMC) per ASTM D698, unless otherwise noted.

[3]Tested per ASTM D1557

Figures



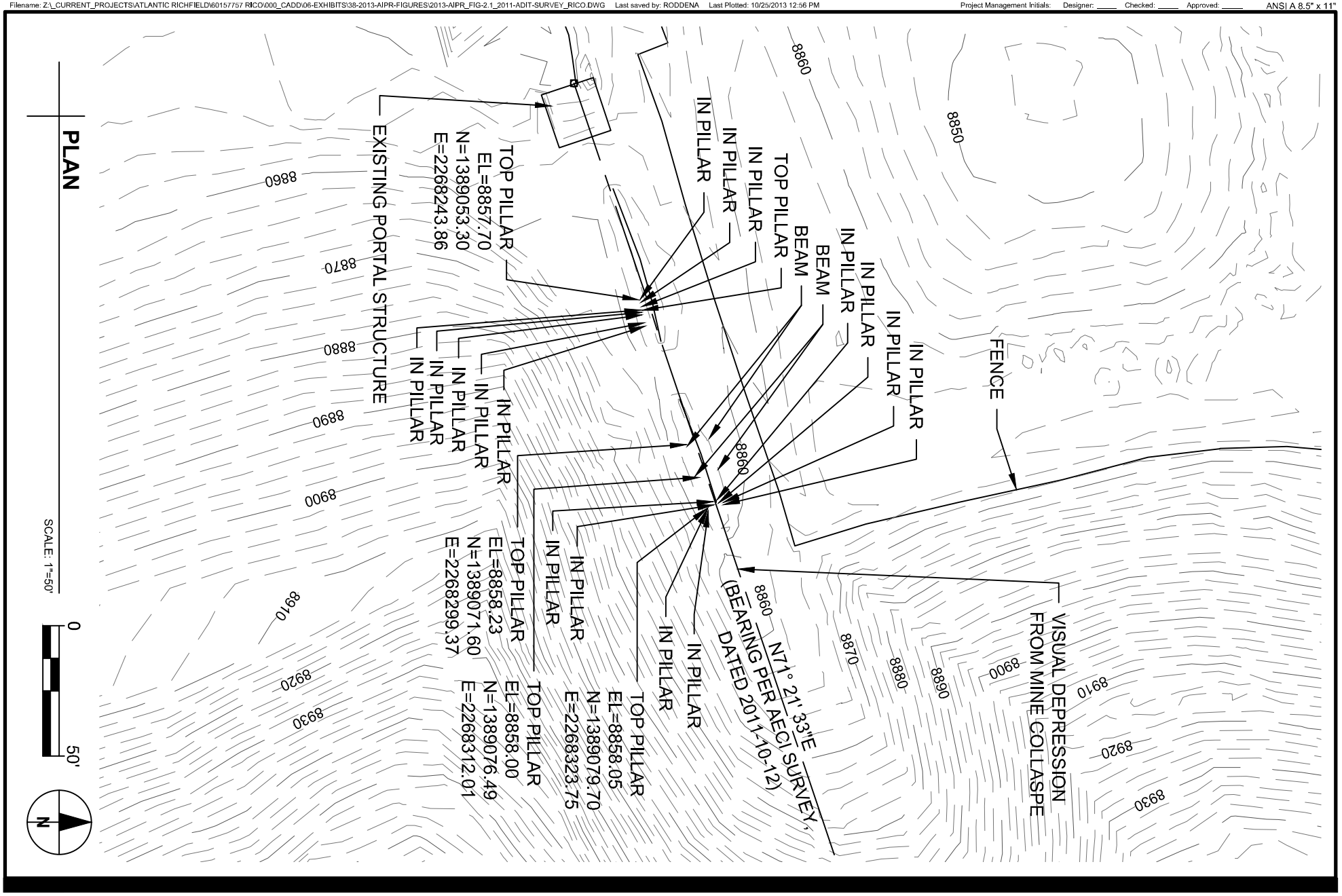
ADIT AND PORTAL INVESTIGATION REPORT – 2013 UPDATE

AECOM

SITE MAP

FIGURE 1.1

60306687



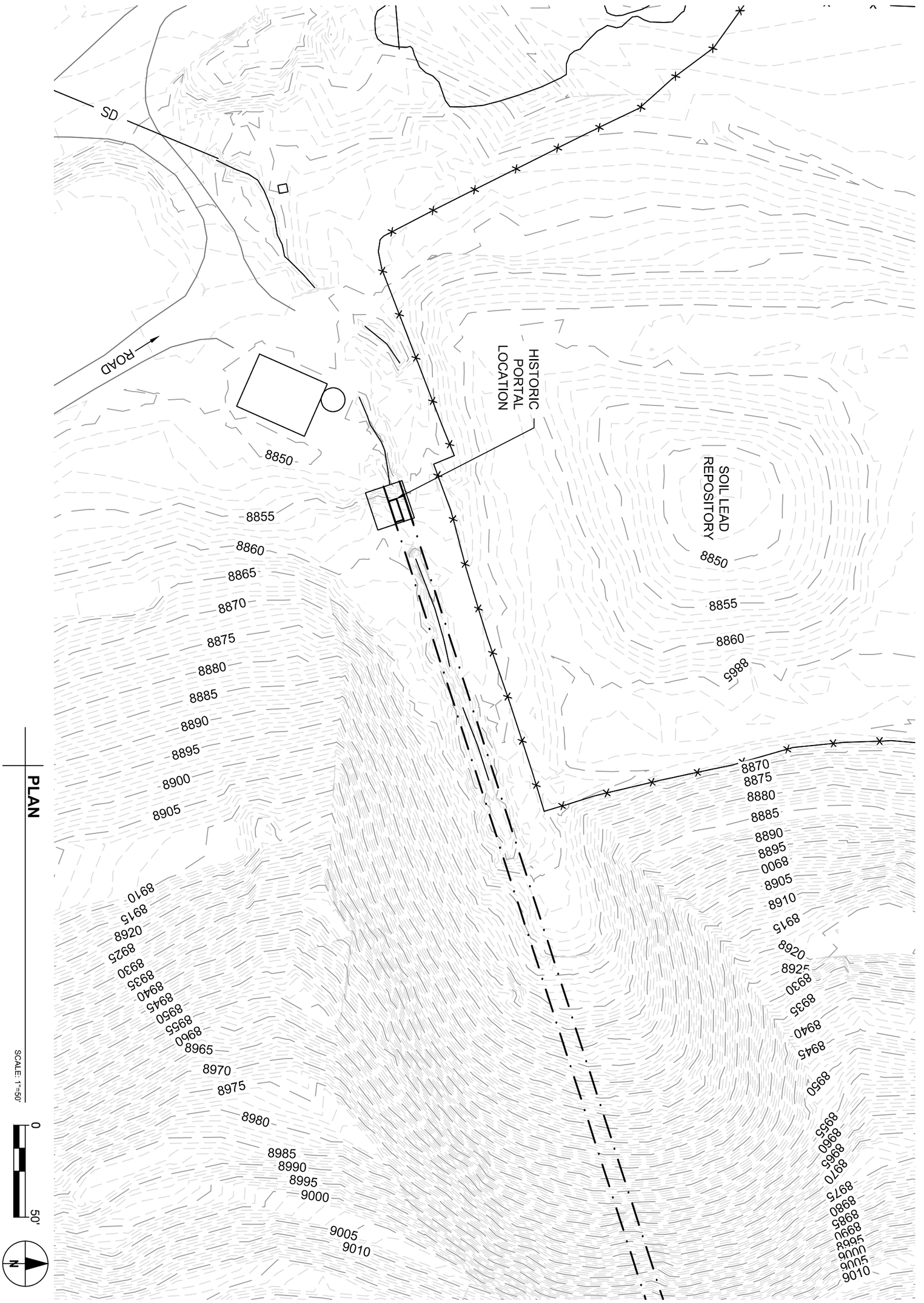
ADIT AND PORTAL INVESTIGATION REPORT - 2013 UPDATE

2011 SURVEY OF COLLAPSED ADIT AREA

FIGURE 2.1

AECOM

60306687



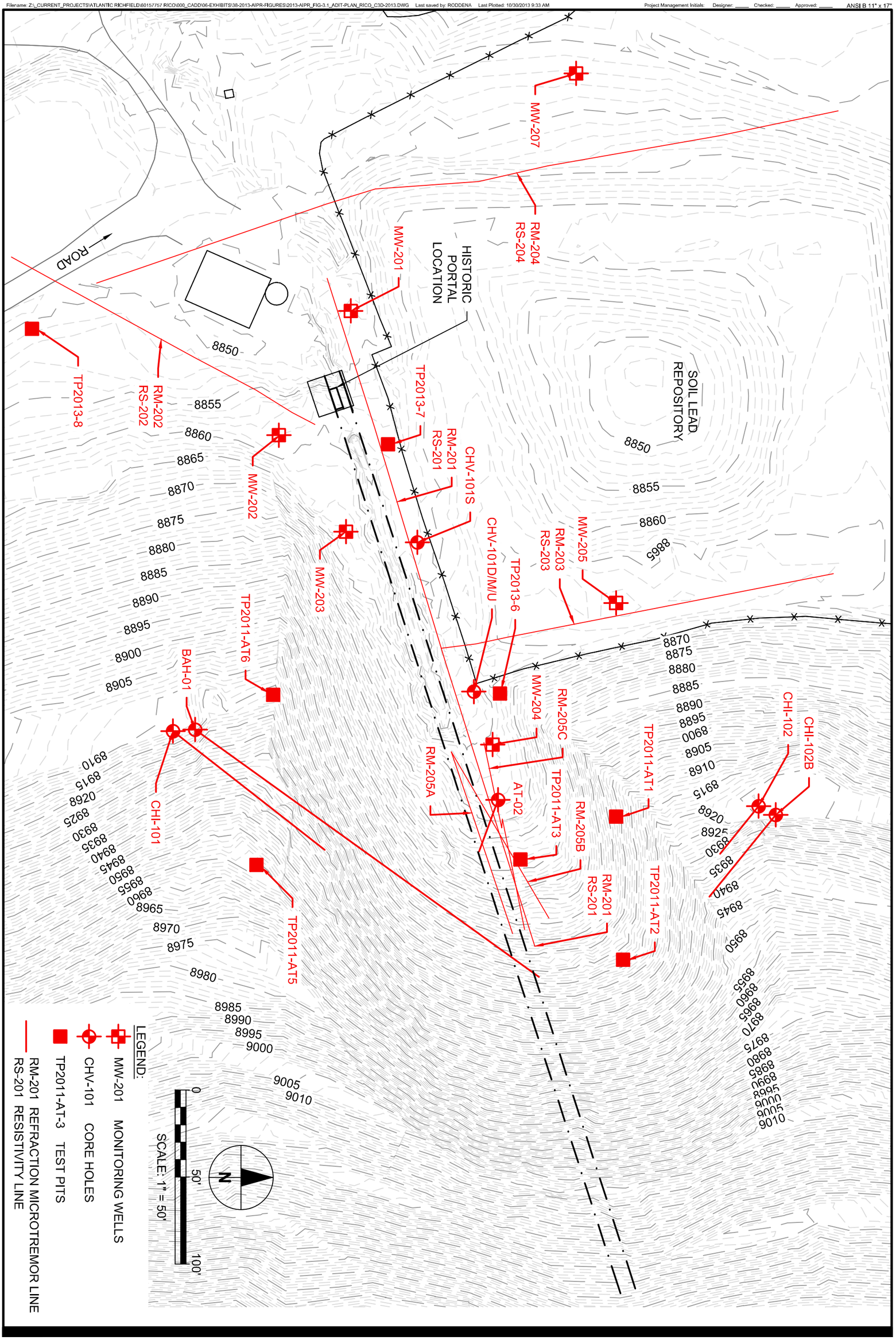
ADIT AND PORTAL INVESTIGATION REPORT - 2013 UPDATE

2013 SURVEY OF COLLAPSED ADIT AREA

FIGURE 2.2

AECOM

60306687



ADIT AND PORTAL INVESTIGATION REPORT - 2013 UPDATE

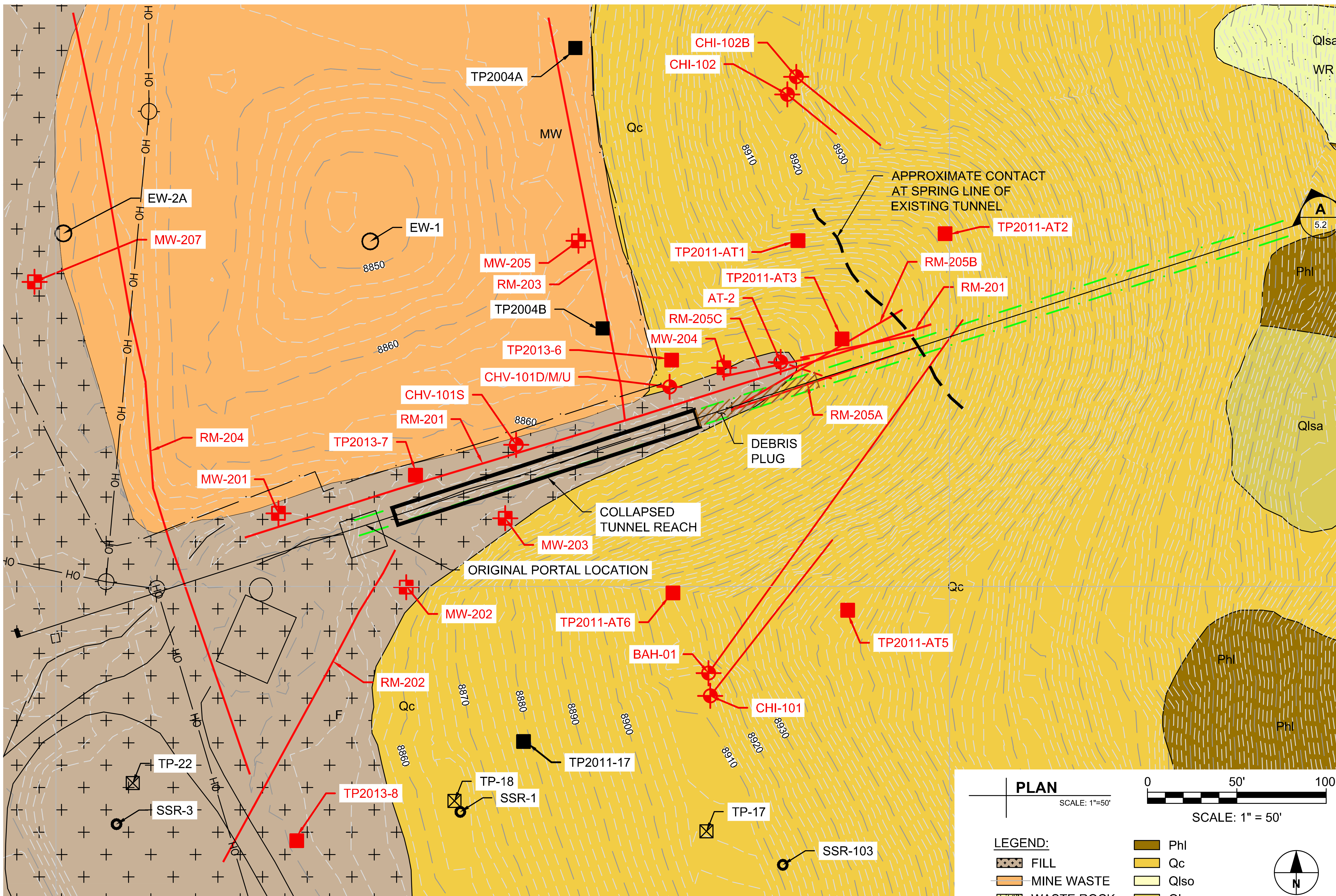
FIELD INVESTIGATION PLAN

FIGURE 3.1

AECOM

OCTOBER 2013

60306687



AECOM

OCTOBER 2013

60306687

ADIT AND PORTAL INVESTIGATION REPORT - 2013 UPDATE

GEOLOGIC MAP

FIGURE 5.1

EXISTING GROUND @ ADIT CENTERLINE

INFERRED GEOLOGIC CONTACT
(OVERBURDEN / BEDROCK)

APPROXIMATE EXISTING GROUND
PRIOR TO "HORSESHOE" EXCAVATION

BAH-01

AT-2

F?

Qc

Phl

ST. LOUIS TUNNEL

APPROX. EXTENT OF LAGGING

9200
9100
9000
8900
8800

0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00

PROFILE
SCALE: 1"=50'

0 50' 100'
SCALE: 1" = 50'

ADIT AND PORTAL INVESTIGATION REPORT - 2013 UPDATE

AECOM
OCTOBER 2013
60306687

GEOLOGIC PROFILE
FIGURE 5.2

Appendix A: Field Investigations

1. **Boring Logs, Core Photographs, and Well Completion Diagrams**
2. **Test Pits**
3. **Surface Geophysical Surveys**

1. Boring Logs, Core Photographs, and Well Completion Diagrams

AT-02
BAH-01
CHI-101
CHI-102A
CHI-102B
CHI-102C
CHI-103
CHV-101D
CHV-101M
CHV-101S
CHV-101U
DG-1
DG-3
EW-1
EW-2A
MW-201
MW-202
MW-203
MW-204
MW-205
MW-206
MW-207
SSR-103

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **AT-2**
	PROJECT NAME: **Rico-Argentine Site - OU01**	ARCHITECT-ENGINEER: **Drilling Company: Boart Longyear**

SITE LOCATION

SURFACE ELEVATION +8,866.2 Feet

DEPTH(FT) / ELEVATION(FT)	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
	Talus slope wash, colluvium, boulders up to 8.0' diameter visible on surface	
13.0	VOID - Drill stem advanced with no down pressure	
16.0	Colluvium	
19.0	Encountered tunnel at 19.0' at a 32 degree angle boring. Drill stem advanced under very little down pressure.	
25.0	Encountered railroad rail, tie and ballast rock from 25.0-26.5' in core barrel - Possible Bedrock	
26.5	Trip out change to HQ core. Continue as rock log below 25.0'.	

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/(FT): 10 20 30 40 50

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING **1389126**	BORING STARTED	AECOM OFFICE **Denver**	
EASTING **2268406**	BORING COMPLETED	ENTERED BY **KKB**	SHEET NO. **1** OF **1**
WL	RIG/FOREMAN **/**	APP'D BY	AECOM JOB NO. **60157757**

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

AECOM	CLIENT **Atlantic Richfield Company**	LOG OF BORING NUMBER **AT-2**
	PROJECT NAME **Rico-Argentine Site - OU01**	ARCHITECT-ENGINEER **Drilling Company: Boart Longyear**
	SITE LOCATION	SURFACE ELEVATION **+8,866.2 Feet**

DEPTH(FT) / ELEVATION(FT)	DRILLING: RUN NO.	DRILLING: CORING TIME, MIN/FT (AVG)	DRILLING: RECOVERY, %	DRILLING: RQD, %	LITHOLOGY: GRAPHIC	LITHOLOGY: VISUAL DESCRIPTION AND REMARKS	DISCONTINUITY: FRACTURE FREQUENCY (BREAK/FT)	DISCONTINUITY: DEPTH, FT	DISCONTINUITY: DIP, DEG	DISCONTINUITY: TYPE	DISCONTINUITY: APERTURE	DISCONTINUITY: INFILL	DISCONTINUITY: AMOUNT	DISCONTINUITY: SHAPE	DISCONTINUITY: ROUGHNESS
	Run No.					Rock core log continued from soil boring log at 25.0'									
25.0	Run No.					25									
	Run No.					26.5 Encountered railroad rail, tie and ballast rock in core barrel									
30.0	Run No.					Bedrock or rock present from 26.5-35.0', Latite porphyry (intrusive rock) No significant recovery									
35.0						35									
						End of boring at 35.0' (drilled at 32 degrees horizontal) Core logged by : L. Beem T.O. Casing EL. 8866.21									

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING **1389126**	BORING STARTED	AECOM OFFICE **Denver**	
EASTING **2268406**	BORING COMPLETED	ENTERED BY **KKB**	SHEET NO. **1** OF **1**
WL (DEPTH)	RIG/FOREMAN **/**	APP'D BY	AECOM JOB NO. **60157757**

AECOM CORELOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11


NO. 79738 HQ DIV.

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **BAH-01**
	PROJECT NAME: **Rico-Argentine Site - OU01**	ARCHITECT-ENGINEER: **Drilling Company: Boart Longyear**

SITE LOCATION

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION +8,912.6 Feet	
					Cobbles, silt, sand - drilling mud: brown-red brown	
					Angle boring at 13 degrees from horizontal	
5.0						
10.0					Easy drilling - drill mud brown	
15.0						
					17.0	
					Cobbles, boulders - drill mud brown with multiple rock type fragments	
20.0						
25.0						
					Easy drilling - drill mud brown with red ss, gray ls and others.	
30.0					30.0	
					Boulder	
					34.0	
35.0					Cobbles, boulders - easy drill - drill mud brown	
					Moderate drill - drill mud brown	
40.0					40.0	
					. . . continued	

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60157757**

SHEET NO. **1** OF **4**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **BAH-01**
	PROJECT NAME: **Rico-Argentine Site - OU01**	ARCHITECT-ENGINEER: **Drilling Company: Boart Longyear**

SITE LOCATION

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1, 2, 3, 4, 5)

PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10, 20, 30, 40, 50)

STANDARD PENETRATION BLOWS/(FT) (10, 20, 30, 40, 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION +8,912.6 Feet (Continued)	
					41.0 Boulder - moderate drill - drill mud brown	
					Cobbles, boulders	
45.0						
50.0					50.0 Boulder - drill mud brown-red brown - multiple rock fragment types	
					53.0 Cobbles, boulders - easy drill	
55.0					55.0 Boulder	
					56.0 Cobbles, boulders - easy drill	
60.0					60.0 Boulder - drill mud brown - multiple rock fragment types	
					64.0 Cobbles, boulders	
65.0					Lost circulation at 65.0'	
					Easy drill - some cobbles	
70.0						
75.0						
80.0						
					. . . continued	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60157757** SHEET NO. **2** OF **4**

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **BAH-01**
	PROJECT NAME: **Rico-Argentine Site - OU01**	ARCHITECT-ENGINEER: **Drilling Company: Boart Longyear**

SITE LOCATION

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION +8,912.6 Feet (Continued)	
	1				Cobbles, boulders	
85.0					85.0	
					Hard boulder - drill mud brown-red brown - multiple rock type fragments	
					88.0	
					Cobbles, boulders - moderate drilling	
90.0						
95.0						
100.0					Circulation 100.0-104.0' - drill mud brown-red brown	
					Relatively easy drilling	
105.0						
110.0						
	2					
115.0						
120.0						
					. . . continued	

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60157757**

SHEET NO. **3** OF **4**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **BAH-01**
	PROJECT NAME: **Rico-Argentine Site - OU01**	ARCHITECT-ENGINEER: **Drilling Company: Boart Longyear**

SITE LOCATION

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION +8,912.6 Feet (Continued)	
					Cobbles, boulders - moderate drilling	
					124.0	
125.0					Boulder - circulation restored - drill mud brown-red brown - multiple rock types in mud	
					127.0	
					Cobbles, boulders - easy drilling	
130.0						
	3					
135.0						
					137.0	
140.0					Boulder - circulation returns drill mud brown-red brown - multiple rock types in mud	
145.0					145.0	
					Drill mud changed to gray-green - mineralogy appears consistent with latite, no other rock fragments present.	
					147.0	
150.0					Drill mast and front of rig lift off the ground, driller backed off down pressure, rig sets back to original location. Driller notes possible bedrock at 147.0'. Drill mud appears to contain latite fragments, no others. Drilled about 6.0" into rock Remove drill string 10/31/2011 (broken roller bit) Replace HWT with core bit and redrill to 147.0' Over burden logged by L. Beem. Continued as rock core log below 147.0'.	
155.0						
160.0						

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING **1388951**	BORING STARTED **10/26/11**	AECOM OFFICE **Denver**	
EASTING **2268365**	BORING COMPLETED **11/9/11**	ENTERED BY **SJH**	SHEET NO. **4** OF **4**
WL	RIG/FOREMAN **/**	APP'D BY **EED**	AECOM JOB NO. **60157757**

AECOM LOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **BAH-01**	
	PROJECT NAME: **Rico-Argentine Site - OU01**	ARCHITECT-ENGINEER: **Drilling Company: Boart Longyear**	
	SITE LOCATION	SURFACE ELEVATION: **+8,912.6 Feet**	

DEPTH(FT) / ELEVATION(FT)	DRILLING: RUN NO.	CORING TIME, MIN/FT (AVG)	RECOVERY, %	RQD, %	LITHOLOGY: GRAPHIC	VISUAL DESCRIPTION AND REMARKS	DISCONTINUITY: FRACTURE FREQUENCY (BREAK/FT)	DEPTH, FT	DIP, DEG	TYPE	APERTURE	INFILL	AMOUNT	SHAPE	ROUGHNESS
145.0	Run No.					Rock core log continued from soil boring log at 147.0'									
						147									
						Cored to 153.0' - recovered few rock fragments of colluvial material. Switch back to HWT casing. No drill fluid return.									
150.0															
						153									
	Run No.					Fragments of sandstone, shale and latite porphyry (Colluvium)									
155.0						156.0' - Fluid returns - medium green gray									
160.0						160									
	Run No.		37	20		Fragments of greenstone, quartz vein, sandstone (Colluvium) - hard - largest clast 0.8' - switch to HQ3 to sample/drill through block - angle of rods 15 degrees - core barrel stuck tripped drill string									
						163									
165.0						Variable hard and soft drilling - advanced HWT casing with shoe bit - medium brown drill fluid returns									
170.0	Run No.														
						174.0' - Add 10.0' feet of casing - reem/no sample									
175.0						177.0' - Quartzite, light gray, unfractured, hard, strong - possible boulder									
						178									
180.0	Run No.		62	32		177.17' - Drilling hard - return fluids change color to dark gray - switch to coring									
						Fines (matrix) wash out during drilling - cored 178.0-183.0' - hard and soft zones - returns varied light gray (hard drilling) to dark dirty									
						183									
						. . . continued									

AECOM CORELOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

The stratification lines represent the approximate boundary lines between soil/rock types: in situ, the transition may be gradual.

AECOM JOB NO. **60157757**

SHEET NO. **1** OF **3**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **BAH-01**
	PROJECT NAME: **Rico-Argentine Site - OU01**	ARCHITECT-ENGINEER: **Drilling Company: Boart Longyear**
	SITE LOCATION	SURFACE ELEVATION: **+8,912.6 Feet**

DEPTH(FT) / ELEVATION(FT)	DRILLING: RUN NO.	CORING TIME, MIN/FT (AVG)	RECOVERY, %	RQD, %	LITHOLOGY: GRAPHIC	VISUAL DESCRIPTION AND REMARKS	DISCONTINUITY: FRACTURE FREQUENCY (BREAK/FT)	DEPTH, FT	DIP, DEG	TYPE	APERTURE	INFILL	AMOUNT	SHAPE	ROUGHNESS
185.0	Run No.					brown (soft drilling)									
						186 "Soft" smooth drilling no cuttings/fluid return - trip HQ rods advance HWT casing through colluvium, no returns									
	Run No.		98	60		185.42' - Drilling becomes hard, switch to HQ3 core									
190.0						190									
	Run No.		80	40		190.5 Sandstone, light green gray, massive, hard, moderately strong, fine grained 189.17' - Dark gray siltstone, closely fractured, moderately hard, weak, grades to s.s.									
195.0	Run No.		41	12		Medium dark gray limestone closely fractured Drill/core to 193.0' and pull drill string									
200.0						200 Sandstone and siltstone with medium brown sandy clay matrix - variable hard to soft drilling - most fines (matrix) washing out 193.42' - Drilling becomes variably hard, soft zones encountered 198-58' - Latite porphyry - light green gray, medium grained with pyrite stringers to veinlets									
	Run No.		78	20											
205.0						205 No circulation Wash out from 200.0-202.33' 202.33' - Latite porphyry, medium bluish gray (5B 5/1), hard, moderately strong with feldspars to 0.25"									
	Run No.		76	0		209.58 204.5' - Shale, medium to dark gray (N3.5), hard, weak, closely fractured.									
210.0						Colluvium consists of mixture of sandstone, shale, arkose with red siltstone									
	Run No.		82	20		Fine grained matrix wash out - clast range from 0.4'-0.5"									
215.0						Altered sandstone - medium greenish gray, fine grained, with apparent relic beds or cross bed at 25 degrees to axis of core - moderately fractured, moderately hard, weak with pyrite and quartz along fracture surfaces (up to 0.25")									
	Run No.		67	0		220.5 214.5' - Small fault zone Possible bedrock at 215.0' Closely fractured									
220.0															
	Run No.		77	0											
						. . . continued									

AECOM CORELOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

The stratification lines represent the approximate boundary lines between soil/rock types: in situ, the transition may be gradual.

AECOM JOB NO. **60157757**

SHEET NO. **2** OF **3**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **BAH-01**
	PROJECT NAME: **Rico-Argentine Site - OU01**	ARCHITECT-ENGINEER: **Drilling Company: Boart Longyear**
SITE LOCATION		SURFACE ELEVATION: **+8,912.6 Feet**

DEPTH(FT) / ELEVATION(FT)	DRILLING: RUN NO.	CORING TIME, MIN/FT (AVG)	RECOVERY, %	RQD, %	LITHOLOGY: GRAPHIC	VISUAL DESCRIPTION AND REMARKS
225.0	Run No.		100	38		224.25 Shear zone - siltstone dark green gray, closely fractured with light gray gouge along fractures. Loss circulation, core blocked, stop trip at 220.5' - switch back to 5.0' core barrel for recovery. Good circulation through 5.0' run - NQ rods at 15.5 to horizontal degrees at surface
230.0	Run No.		34	0		230 / 231 Siltstone, medium dark gray (N3.5), hydrothermally alt., finely dissim. pyrite, closely fractured with quartz veins and veinlets 0.063-.125" , moderately hard, weak to moderate;y strong.
235.0	Run No.		96	0		235.2 Quartz vein, white to light gray (N9-N7), with vugs. Lost circulation. Shear zone with fault gouge, intensely fractured
240.0	Run No.		20	0		240 Sandstone/siltstone, medium dark gray (N4/5), sandstone very fine grained grades at 238.0' to siltstone, closely fractured, moderately hard, weak with pockets of pyrite and quartz to 0.25"
245.0	Run No.					240.0-252.0' - VOID - pushed rods with no resistance except for apparent slough zone when lowered rods to 244.0' to advance another 5.0'. Pushed back through void from 246.0-252.0'. Assume one continuous void (St. Louis Tunnel)
250.0	Run No.					252
255.0	Run No.					Drill stem appeared to be following tunnel; at risk of losing core barrel terminated drilling hole after 12.0' of void.
260.0						

DISCONTINUITY: FRACTURE FREQUENCY (BREAK/FT)	DEPTH, FT	DIP, DEG	TYPE	APERTURE	INFILL	AMOUNT	SHAPE	ROUGHNESS

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING: **1388951**	BORING STARTED: **10/26/11**	AECOM OFFICE: **Denver**	
EASTING: **2268365**	BORING COMPLETED: **11/9/11**	ENTERED BY: **SJH**	SHEET NO.: **3** OF: **3**
WL (DEPTH)	RIG/FOREMAN: **/**	APP'D BY: **EED**	AECOM JOB NO.: **60157757**

AECOM CORELOG 60157757.GPJ FS_DATATEMPLATE.GDT 12/13/11

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **CHI1-102(B)**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION Feet	
		HW			Mixture of soil and rock fragments are predominantly 1/2 red brown fine grained sandstone, 1/2 bluish green altered quartzite with finely diss py; rock set in red brown sandy silt soil	
5.0		HW				
10.0		HW				
15.0		HW				
20.0		HW				
25.0		HW				
30.0		HW				
					. . . continued	

AECOM LOG 60239818 RICO-UPDATED 4-8-13.GPJ FS_DATATEMPLATE.GDT 4/29/13

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818**

SHEET NO. **1** OF **3**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **CHI1-102(B)** **DRAFT**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION Feet (Continued)	
					Mixture of soil and rock fragments are predominantly 1/2 red brown fine grained sandstone, 1/2 bluish green altered quartzite with finely diss py; rock set in red brown sandy silt soil Hard zone noted at 33.0 ft	
35.0		HW				
40.0		HW				
45.0		HW				
					47.5 Boulder	
50.0		HW				
					51.5 Mixture of soil and rock fragments are predominantly 1/2 red brown fine grained sandstone, 1/2 bluish green altered quartzite with finely diss py; rock set in red brown sandy silt soil	
55.0		HW				
60.0		HW				
					. . . continued	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** SHEET NO. **2** OF **3**

AECOM LOG 60239818 RICO-UPDATED 4-8-13.GPJ FS_DATATEMPLATE.GDT 4/29/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **CHI1-102(B)** **DRAFT**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)
				SURFACE ELEVATION Feet (Continued)		
		HW		Mixture of soil and rock fragments are predominantly 1/2 red brown fine grained sandstone, 1/2 bluish green altered quartzite with finely diss py; rock set in red brown sandy silt soil		
65.0				65.0		
				End of boring at 65 ft. Casing apparently separated at 62 ft. Pulled the hammer and rods out and left 5" I.D. casing.		

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING	BORING STARTED **10/11/12**	AECOM OFFICE **Denver**	
EASTING	BORING COMPLETED **10/17/12**	ENTERED BY **AMH**	SHEET NO. **3** OF **3**
WL **None Observed**	RIG/FOREMAN **Modified Ditchwitch/Kyle King**	APP'D BY	AECOM JOB NO. **60239818**

AECOM LOG 60239818 RICO-UPDATED 4-8-13.GPJ FS_DATATEMPLATE.GDT 4/29/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **CHV-101D**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION Feet	
5.0	1	SON			Colluvium - 0% boulder, 5% cobble, 55% gravel, 10% coarse sand, 10% medium sand, 10% fine sand, 10% fines, 0% organics - 5YR 4/3 Cobbles from 4.0 to 5.0 feet	
					8.0	
10.0					Colluvium - 0% boulder, 2% cobble, 50% gravel, 11% coarse sand, 11% medium sand, 11% fine sand, 15% fines, 0% organics - 10 YR 4/3 Perched water at 9.0 feet Water Test at 11.0 feet	
15.0	2A	SON				
20.0					20.0	
25.0	2B	SON			Colluvium - 0% boulder, 2% cobble, 50% gravel, 14% coarse sand, 13% medium sand, 13% fine sand, 8% fines, 7% organics - 5 YR 4/4 Water Test at 20.0 feet Color becomes 10 YR 4/4 Cobbles form 23.0 to 29.0 feet	
30.0					Perched water at 29.0 feet Water Test at 29.5 feet	
					. . . continued	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** SHEET NO. **1** OF **5**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **CHV-101D**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1, 2, 3, 4, 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10, 20, 30, 40, 50)

STANDARD PENETRATION BLOWS/(FT) (10, 20, 30, 40, 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION Feet (Continued)	
					Colluvium - 0% boulder, 2% cobble, 50% gravel, 14% coarse sand, 13% medium sand, 13% fine sand, 8% fines, 7% organics - 5 YR 4/4	
					33.0	
					Colluvium - 0% boulder, 5% cobble, 50% gravel, 14% coarse sand, 13% medium sand, 13% fine sand, 8% fines, 0% organics - 10YR 4/4	
35.0					Perched water at 35.0 feet	
	3	SON			Color becomes 7.5 YR 2.5/5 Fines drop to 5% Significant black carbon content	
40.0					Water Test at 40.0 feet	
					41.0	
					Alluvial/Colluvium - 0% boulder, 2% cobble, 50% gravel, 12% coarse sand, 12% medium sand, 12% fine sand, 12% fines, 0% organics - 10YR 4/4	
45.0					Water at 44.0 feet (saturated zone)	
	4	SON				
50.0					50.0	
					Alluvial/Colluvium - 0% boulder, 2% cobble, 50% gravel, 14% coarse sand, 13% medium sand, 13% fine sand, 8% fines, 0% organics - 5 YR 4/4 Water Test at 50.0 feet	
55.0	5	SON				
60.0					60.0	
					. . . continued	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** SHEET NO. **2** OF **5**

AECOM LOG 60239818 RICO-UPDATED 10-11-13.GPJ FS_DATATEMPLATE.GDT 10/15/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **CHV-101D**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
				SURFACE ELEVATION Feet (Continued)	
				61.0 Water Test 60.0 feet	
65.0	6	SON		Alluvium - 0% boulder, 0% cobble, 20% gravel, 20% coarse sand, 30% medium sand, 25% fine sand, 5% fines, 0% organics - 5 YR 4/3	
				67.5	
70.0	7	SON		Alluvium - 0% boulder, 0% cobble, 5% gravel, 40% coarse sand, 30% medium sand, 20% fine sand, 5% fines, 0% organics - 2.5 YR 4/3 Water Test at 70.0 feet	
75.0				75.0	
80.0	8	SON		Alluvium - 0% boulder, 5% cobble, 0% gravel, 20% coarse sand, 30% medium sand, 40% fine sand, 5% fines, 0% organics - 5 YR 3/3 Water Test 80.0 feet	
85.0				85.0	
	9	SON		Alluvium - 0% boulder, 0% cobble, 60% gravel, 10% coarse sand, 10% medium sand, 15% fine sand, 5% fines, 0% organics - 2.5 YR 4/1 4.0-inch+ cobble, dark gray sand stone	
90.0				90.0	
				. . . continued	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** SHEET NO. **3** OF **5**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **CHV-101D**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)
					SURFACE ELEVATION Feet (Continued)		
					Water Test 90.0 feet		
95.0					Color: 2.5 YR 4/2 3.0-inch red sandstone cobble		
					97.0		
	10	SON			Colluvium/Alluvium - 0% boulder, 10% cobble, 40% gravel, 12% coarse sand, 13% medium sand, 15% fine sand, 10% fines, 0% organics - 1 GLEY 4/1		
100.0					100.0		
					Severly weathered boulders/cobbles - ?% boulder, 10% cobble, 70% gravel, 10% coarse sand, 5% medium sand, 5% fine sand, 2% fines, 0% organics - 1 GLEY 4/1 Water Test at 100.0 feet		
105.0					Boulders pulverized by drilling process 104.0-106.0 feet - limestone 106.0-113.0 feet - dark gray sandstone/limestone 113.0-115.0 feet - dark gray sandstone 115.0-119.0 feet - dark gray sandstone 119.0-120.0 feet - dary gray sandstone 120.0- 121.0 feet - dark gray mud stone		
110.0					Water Test at 109.5 feet		
115.0							
120.0					. . . continued		

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** SHEET NO. **4** OF **5**

AECOM LOG 60239818 RICO-UPDATED 10-11-13.GPJ FS_DATATEMPLATE.GDT 10/15/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **CHV-101D**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)
SURFACE ELEVATION Feet					(Continued)		
	11	SON			Severly weathered boulders/cobbles - ?% boulder, 10% cobble, 70% gravel, 10% coarse sand, 5% medium sand, 5% fine sand, 2% fines, 0% organics - 1 GLEY 4/1 Water Test at 120.0 feet Residual low plasticity silt from weathered boulder 1 GLEY 3/N calcareous and non-calcareous hard sandstone cobbles and gravels, weathered mud stone, scattered chuncks of hard recemented fault gouge with unoxided pyrite mineralization, no residual soils returned form 132.0 to 135.0 feet, could be due to wet core method		
125.0							
130.0					Water Test at 130.0 feet		
135.0					Very thin to thinly laminated significant sandstones to mud stones, significant pyrite mineralization along bedding planes, bedding planes on intact core fragement oriented near horizontal		
140.0					140.0 Uncemented fault gouge with 1 GLEY 2.5/N non-calc siltsone chunks in low to moderate plastic, 1 GLEY 2.5/N silt (ML) matrix		

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING	BORING STARTED	AECOM OFFICE: **Denver**	
EASTING	BORING COMPLETED	ENTERED BY: **CAH**	SHEET NO. **5** OF **5**
WL	RIG/FOREMAN: **Boart/Longyear Sonic 300/Rick Mallet**	APP'D BY	AECOM JOB NO.: **60239818**

AECOM LOG 60239818 RICO-UPDATED 10-11-13.GPJ FS_DATATEMPLATE.GDT 10/15/13


RICO
CHV-10ID
2 OCT 13


RICO
CHV-1010
20
25
30
35
25
30
35
40


R.CO
CHV-10LD
40 45
45 50


RICO
CHV-101A
50
55
55
60


RICO
CHV-101D
60 65
65 70


RICO
CHV-10LD
740
745
745
80


RICO
CHV-101D
90 95
95 100


RICO
CHV-101D
100
105
105
110


RICO
CHV-101D
110
115
115
120
137.5


RICO
CHV-101D
120
125
125
130


RICO
CHV-101A
130
140


RICO
CHV-101A
190
196
4.10.2013 15:02


RICO
CHV-101-D
146
165
4. 10. 2013 16:05


CHV-101D
165
175


CHV-101D
175
185

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **CHV-101M** — **DRAFT**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/(FT): 10 20 30 40 50

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
				SURFACE ELEVATION Feet	
5.0					
10.0					
15.0					
20.0					
25.0					
30.0				. . . continued	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** | SHEET NO. **1** OF **2**

AECOM LOG 60239818 RICO-UPDATED 10-11-13.GPJ FS_DATATEMPLATE.GDT 10/21/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **CHV-101M**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)
				SURFACE ELEVATION Feet (Continued)		
35.0						
38.3						

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING	BORING STARTED	AECOM OFFICE: **Denver**	
EASTING	BORING COMPLETED	ENTERED BY: **AMH**	SHEET NO. **2** OF **2**
WL	RIG/FOREMAN: /	APP'D BY	AECOM JOB NO. **60239818**

AECOM LOG 60239818 RICO-UPDATED 10-11-13.GPJ FS_DATATEMPLATE.GDT 10/21/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **CHV-101S (MW)**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
				SURFACE ELEVATION +8,858.9 Feet	
	1	AS		FILL: Clayey sand, some fine to coarse gravel - 24% gravel, 46% fine to coarse sand, 30% fines - dark reddish brown 5YR3/2 - loose (FILL: SC)	
	2	SS			
5.0		HSA			
	3	SS			
		HSA		7.5	
	4	SS		Silty sand with fine to coarse gravel - 14% fines - brown 7.5YR4/2 - medium dense - moist (SM-GM)	
10.0		HSA			
	5	SS			
		HSA		12.0	
	6	SS		Clayey sand with gravel - 40% fine gravel, 43% fine to coarse sand, 17% fines - reddish brown 5YR4/3, with color change to olive gray 5Y3/2 @ 17.5 ft - medium dense - saturated at 12.8' in perched ground water table (SC)	
15.0		HSA			
	7	SS			
		HSA			
	8	SS			
20.0		HSA		20.0	
	9	SS		Lean clay, low plasticity, some fine to coarse gravel, some fine to coarse sand - brown 10YR4/3 - very stiff (CL)	
		HSA		22.5	
	10	SS		Clayey gravel, some fine to coarse sand - brown 10YR4/3 - medium dense - wet (GC)	
25.0		HSA			
	11	SS			
		HSA		27.5	
	12	SS		Silty gravel , some fine to coarse sand - 14% fines - olive gray 5Y4/2 - dense - wet (GM)	
		HSA		29.0 Boulder	
30.0				29.7	
				. . . continued	

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** | SHEET NO. **1** OF **2**

AECOM LOG 60239818 RICO-UPDATED 4-8-13.GPJ FS_DATATEMPLATE.GDT 4/29/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **CHV-101S (MW)** **DRAFT**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION +8,858.9 Feet (Continued)	
	13	SS			Clayey gravel, some fine to coarse sand - brown 10YR5/3 - dense - wet (GC)	
					32.0 Boulders and Cobbles	
35.0					35.0 Cobbles, gravel, and sand	
					37.0 Gravel	
		HSA			38.0 Cobbles	
40.0					40.0 Gravel and cobbles	
					41.0 Cobbles	
					42.0 Gravel and Cobbles	
					44.0 Well graded silty gravel and fine to coarse sand, trace clay, with seams of clayey gravelly sand - 15% fines - brown 10YR4/3 - very dense - wet (GM) - with seams of clayey sand (SC)	
45.0	14	SS				
		HSA				
48.0					48.0 Drilled with 4-1/4" ID HSA to 29 feet. Auger refusal at 29 feet due to boulder. Offset 6' east and blank drilled to 30 feet. Offset boring advanced to 48 feet with 4-1/4" HSA with auger refusal at 48 feet. Piezometer installed in borehole with tip at 48 feet.	

STANDARD PENETRATION BLOWS/(FT): 37, 63

***** Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING **1389079.288**	BORING STARTED **11/1/12**	AECOM OFFICE **Denver**	
EASTING **2268257.515**	BORING COMPLETED **11/2/12**	ENTERED BY **AMH**	SHEET NO. **2** OF **2**
WL **W.L. @ 27.1 W.S.**	RIG/FOREMAN **CME 85/Rory Pilmore**	APP'D BY	AECOM JOB NO. **60239818**

AECOM LOG 60239818 RICO-UPDATED 4-8-13.GPJ FS_DATATEMPLATE.GDT 4/29/13

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
St. Louis Ponds Area, Rico, Colorado	AARCOE0105.00	EW-1

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jeff Pennell Layne-Western	11/20/2004	11/21/2004	odex

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		EW-1	Feet Site	8,850.5 Feet Site	5.0 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐
State Plane N, E S/C/N
NW 1/4 of NW 1/4 of Section 25, T 40 N, R 10 W
Lat ° ' "
Long ° ' "
Local Grid Location ☒ N ☒ E
1389193 Feet ☐ S 2268176 Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
			Rico, Colorado

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24	17-20 15-11	2	FILL: Brown, dense, GRAVELLY SAND, some organics in surface soils.					35					Note: Compressive Strength = SPT N value
2 SS	24	5-7 7-7	4	Brown, medium dense, fine to coarse grained CLAYEY SAND, with gravel.	SC				14					Note: Length att. on split spoon = 24"
3 SS	24	5-11 5-2	6						16					
				Brown, loose, fine to coarse grained, CLAYEY SAND.	SC									
4 SS	24	4-4 6-3	8	Brown, loose to very dense, fine to coarse grained, CLAYEY SAND and gravel					10					
5 SS	24	2-8 4-5	10						12					
1 SH	6		12											
6 SS	24	5-4 2-4	14		SC				6					approx. 6 inches recovery
2 SH	24		16											
7 SS	24	6-8 10-8	18						18					
			20											
8 SS	24	50	22	Brown-gray, very dense, fine-coarse GRAVEL, with sand and clay	GP				50					
			24											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Daniel R. Reed Firm: **SEH Inc** 421 Frenette Drive, Chippewa Falls, WI 54729, www.sehinc.com Tel: 715.720.6200 Fax: 715.720.6300

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number EW-1 Use only as an attachment to Form 4400-122.

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			26	Brown-gray, very dense, fine-coarse GRAVEL, with sand and clay	GP									
			28	End of boring at 28' (refusal)										

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
St. Louis Ponds Area, Rico, Colorado	AARCOE0105.00	EW-2A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jeff Pennell Layne-Western	11/21/2004	11/21/2004	odex

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet Site	8,846.4 Feet Site	5.0 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐
State Plane N, E S/C/N
NW 1/4 of NW 1/4 of Section 25, T 40 N, R 10 W
Lat ° ' "
Long ° ' "
Local Grid Location ☒ N ☒ E
1389198 Feet ☐ S 2268004 Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
			Rico, Colorado

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24	1-3 12-9	2	FILL: Brown, dense, GRAVELLY SAND, some organics in surface soils.					15					Note: Compressive Strength = SPT N value
2 SS	24	3-7 4-5	4	Brown, loose, fine to coarse grained CLAYEY SAND, with gravel.	SC				11					Note: Length att. on split spoon = 24"
3 SS	24		6	Brown, loose, SANDY CLAY to clayey sand, with gravel.	CL									
4 SS	24	3-4 3-3	8	Brown, medium stiff, SANDY CLAY, with gravel	CL-ML				7					
5 SS	24	5-8 8-17	10 12	Brown, stiff, SANDY CLAY to clayey sand, with gravel	CL-ML				16					
				End of boring at 12' (abandoned)										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Daniel R. Reed Firm **SEH Inc** 421 Frenette Drive Chippewa Falls, WI 54729 www.sehinc.com Tel: 715.720.6200 Fax: 715.720.6300

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number EW-1 Use only as an attachment to Form 4400-122.

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			26	Brown-gray, very dense, fine-coarse GRAVEL, with sand and clay	GP									
			28	End of boring at 28' (refusal)										

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-201**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION Feet	
	1	SON			Fill - 0% boulders, 2% cobble, 50% gravel, 12% coarse sand, 12% medium sand, 14% fine sand, 10% fines, 0% organics - 7.5 YR 3/2	
5.0					8.5	
	2	SON			Waste Rock - 0% boulder, 0% cobble, 40% gravel, 25% coarse sand, 20% medium sand, 10% fine sand, 5% fines, 0% organics - 10 YR 5/6	
10.0					10.0	
	3	SON			0.5-inch black waste material (coal cinders) Perched water at 9.0 feet through sandy gravel layer less than 6.0 inches thick Waste Rock - 0% boulder, 2% cobble, 40% gravel, 15% coarse sand, 15% medium sand, 15% fine sand, 13% fines, 0% organics - 10 YR 3/3 Clean limestone cobble zone from 13.0-14.0 feet	
15.0					15.0	
	4	SON			Flood Plain Deposits - 0% boulder, 0% cobble, 30% gravel, 15% coarse sand, 15% medium sand, 15% fine sand, 25% fines, 2% organics - 5 YR 2.5/1 Perched water at 17.0 feet Root fragments	
20.0					20.0	
	5	SON			Colluvium/Alluvium Mix - 0% boulder, 0% cobble, 30% gravel, 15% coarse sand, 15% medium sand, 20% fine sand, 20% fines, trace organics - 7.5 YR 3/2 Water Test at 20.0 feet	
25.0					Jumbled chunks of black organic silt and sand at 26.0 feet	
30.0					Severly weathered red sandstone gravels from 29.0 to 30.0 feet	

. . . continued

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** | SHEET NO. **1** OF **3**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-201**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION Feet (Continued)	
					30.5	
	6	SON			Colluvium/Alluvium Mix - 0% boulder, 5% cobble, 55% gravel, 10% coarse sand, 10% medium sand, 10% fine sand, 10% fines, 0% organics - 7.5 YR 4/4	
					33.0	
35.0	7	SON			Colluvium/Alluvium Mix - 0% boulder, 5% cobble, 50% gravel, 10% coarse sand, 10% medium sand, 10% fine sand, 15% fines, 0% organics - 2.5 YR 5/3 Water at 33.0 feet Grades to 7.5 YR 4/3 at 35.0 feet	
					37.5	
40.0					Limestone Cobbles - 0% boulder, 2% cobble, 55% gravel, 15% coarse sand, 10% medium sand, 10% fine sand, 8% fines, 0% organics - 7.5 YR 4/4 Water Test at 40.0 feet	
					Grades to 7.5 YR 4/4	
45.0	8	SON				
					Grades to 5 YR 4/4	
50.0					50.0	
					Alluvium - 0% boulders, 0% cobbles, 60% gravel, 10% coarse sand, 15% medium sand, 10% fine sand, 5% fines, 0% organics - 5 YR 4/4 Water Test at 50.0 feet	
55.0	9	SON			Medium coarse sand lense from 54.5 to 55.0 feet	
					Small coal particle - gravel-sized	
60.0					60.0	
					. . . continued	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** | SHEET NO. **2** OF **3**

AECOM	CLIENT **Atlantic Richfield Company**	LOG OF BORING NUMBER **MW-201**
	PROJECT NAME **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER **Anderson Engineering Company, Inc.**

SITE LOCATION **Rico-Argentine**

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)
				SURFACE ELEVATION Feet (Continued)		
				End of Boring Note: Water testing data and interpreted hydraulic conductivity are documented seperately		

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING	BORING STARTED	AECOM OFFICE **Denver**	
EASTING	BORING COMPLETED	ENTERED BY **CAH**	SHEET NO. **3** OF **3**
WL	RIG/FOREMAN **Boart/Longyear Sonic 300/Rick Mallet**	APP'D BY	AECOM JOB NO. **60239818**

AECOM LOG 60239818 RICO-UPDATED 10-11-13.GPJ FS_DATATEMPLATE.GDT 10/15/13


RICO ST. LOUIS
MW-201
8 OCT 13
0 - 5
5 - 10


RICO ST. LOUIS
MW-201
8 OCT 13
10 - 20


RICO ST. LOUIS
MW-201
8 OCT 13
20 - 25
25 - 30


RICO ST. LOUIS
MW-201
8 OCT 13
30-35
35-40


RICO ST. LOUIS
MW-201
8 OCT 13
40 - 45
45 - 50
HOMER'S
ALL-PURPOSE
BUCKET
5 Gallons


RICO ST. LOUIS
MW-201
8 OCT 13
50 - 55
55 - 60
HOMER'S
ALL-PURPOSE
BUCKET
5 Gallons

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-202** / **DRAFT**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

SURFACE ELEVATION +8,859.2 Feet

DEPTH(FT)	ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
		1	SON		FILL: Well graded gravel, some sand, little silt - 57% gravel, 30% sand, 13% fines - 10YR3/2 - (FILL: GM)	
					2.0	
		2,3	SON		Clayey sand and gravel, some silt - 35% gravel, 40% fine to coarse sand, 25% fines - 7.5YR4/3 (SC)	
5.0						
					6.0	
					Well graded clayey gravel and sand, little silt - 7/5YR4/3 (GW-GC)	
					9.0	
10.0		3,4	SON		Clayey sand and gravel, some silt - 35% gravel, 40% fine to coarse sand, 25% fines - 7.5YR4/3 (SC)	
					13.0	
15.0		5	SON		Well graded sand, some gravel, little silt - 20% gravel, 71% fine to coarse sand, 9.3% silt - 10YR4/3 (SW-SM)	
20.0		6	SON			
					23.5	
25.0		7	SON		Well graded sand, some gravel, little silt - 20% gravel, 71% fine to coarse sand, 9.3% silt - 10YR4/4 (SW-SM)	
30.0						

. . . continued

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/(FT): 10 20 30 40 50

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** | SHEET NO. **1** OF **2**

AECOM LOG 60239818 RICO-UPDATED 4-8-13.GPJ FS_DATATEMPLATE.GDT 4/29/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-202** / **DRAFT**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/(FT): 10 20 30 40 50

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION +8,859.2 Feet (Continued)	
35.0	8	SON			Well graded sand, some gravel, little silt - 20% gravel, 71% fine to coarse sand, 9.3% silt - 10YR4/4 (SW-SM)	
					35.5	
38.8		RB			Blind Drilling	
					38.8	
					End of boring at 38.8 ft. Boring advanced to 35.5 feet with sonic drilling techniques, boring advanced to 38.8 feet using mud rotary techniques. Piezometer installed with tip at 38.8 feet.	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING: **1388999.649**	BORING STARTED: **11/8/12**	AECOM OFFICE: **Denver**	
EASTING: **2268195.978**	BORING COMPLETED: **11/11/12**	ENTERED BY: **AMH**	SHEET NO.: **2** OF **2**
WL: **W.L. @ 22.5' W.D.**	RIG/FOREMAN: **AMS Compact Sonic 10-C/Kyle King**	APP'D BY:	AECOM JOB NO.: **60239818**

AECOM LOG 60239818 RICO-UPDATED 4-8-13.GPJ FS_DATATEMPLATE.GDT 4/29/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-203**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION Feet	
	1	SON			Colluvium - 0% cobble, 40% gravel, 15% coarse sand, 15% medium sand, 15% fine sand, 15% fines, trace organics - 7.5 YR 3/2	
5.0					6.0	
	2	SON			Colluvium - 2% cobble, 35% gravel, 15% coarse sand, 15% medium sand, 13% fine sand, 20% fines, 0% organics - 10 YR 4/3	
10.0					10.0	
	3	SON				
					11.5	
	4	SON			Colluvium - 0% cobble, 30% gravel, 20% coarse sand, 20% medium sand, 20% fine sand, 10% fines, 0% organics - 10 YR 4/4 Perched water	
15.0						
					4.0-inch+ cobble	
20.0					21.0	
	5	SON			Colluvium - 0% cobble, 40% gravel, 15% coarse sand, 15% medium sand, 15% fine sand, 15% fines, 0% organics - 7.5 YR 3/2	
25.0					26.0	
	6A	SON			Colluvium - 0% cobble, 50% gravel, 11% coarse sand, 12% medium sand, 12% fine sand, 15% fines, 0% organics - 10 YR 4/3	
30.0						
					. . . continued	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** SHEET NO. **1** OF **3**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-203**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION Feet (Continued)	
					31.5	
	6B	SON			Colluvium - 0% cobble, 50% gravel, 10% coarse sand, 10% medium sand, 15% fine sand, 15% fines, 0% organics - 10 YR 5/4 Severely weathered gray cobbles	
35.0					35.0	
					36.0 Intact boulder	
	7	SON			Colluvium - 0% cobble, 50% gravel, 12% coarse sand, 12% medium sand, 12% fine sand, 14% fines, 0% organics - 5 YR 4/3	
40.0					40.0	
	8	SON			Colluvium - 0% cobble, 50% gravel, 12% coarse sand, 12% medium sand, 13% fine sand, 15% fines, 0% organics - 2.5 YR 4/2	
45.0					46.5	
	9	SON			Alluvium/Colluvium - 0% cobble, 60% gravel, 10% coarse sand, 10% medium sand, 10% fine sand, 10% fines, 0% organics - 5 YR 3/3	
50.0					50.0	
55.0					57.0	
	10	SON			Alluvium/Colluvium - 5% cobble, 50% gravel, 11% coarse sand, 11% medium sand, 11% fine sand, 12% fines, 0% organics - 7.5 YR 4/3	
60.0					. . . continued	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818**

SHEET NO. **2** OF **3**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-203**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)
					SURFACE ELEVATION Feet (Continued)		
62.0					Alluvium/Colluvium - 5% cobble, 50% gravel, 11% coarse sand, 11% medium sand, 11% fine sand, 12% fines, 0% organics - 7.5 YR 4/3		
					62.0 End of Boring		

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING	BORING STARTED	AECOM OFFICE: **Denver**	
EASTING	BORING COMPLETED	ENTERED BY: **CAH**	SHEET NO.: **3** OF **3**
WL	RIG/FOREMAN: **Boart/Longyear Sonic 300/Rick Mallet**	APP'D BY	AECOM JOB NO.: **60239818**

AECOM LOG 60239818 RICO-UPDATED 4-8-13.GPJ FS_DATATEMPLATE.GDT 10/14/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-204**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
				SURFACE ELEVATION +8,866.0 Feet	
5.0	1	SON		Well graded sandy gravel, trace silt, slightly moist - 74% gravel, 23% sand, 3% fines - 5YR3/1 (GW)	
				7.0 Approximate top of timbers in nearby St. Louis Adit @ 6.5'	
10.0	2	SON		Well graded sandy gravel - 50% gravel (subangular to subrounded), 35% sand, 15% fines- slightly moist to moist - 7.5YR4/3 (GW-GC) Approximate level of flowing water in adit 15'-20' away @ 8.0'.	
				10.5	
	3	SON		Well graded sandy gravel, trace silt, slightly moist - 67% gravel, 30% sand, 3% fines - 10YR4/2 (GW)	
				12.0	
15.0	4	SON		Well graded sandy gravel = 60% gravel (subangular to subrounded), 30% sand, 10% fines - saturated - 10YR4/4 (GW-GC) NOTE: Possible perched groundwater at 12 feet. (Approx elev. = 8854 ft)	
				15.0	
20.0		RB		No sampling from 15'-21' Boulders and cobbles, rough drilling, lost approximately 150 gallons of drilling mud.	
				21.0	
25.0	5	SON		Well graded sandy gravel, trace silt - 60% gravel (angular to subrounded), 25% sand, 15% fines - 5YR3/3 (GW-GM)	
				25.5	
30.0		RB		No sampling from 25.5'-31.5'	
				. . . continued	

AECOM LOG 60239818 RICO-UPDATED 4-8-13.GPJ FS_DATATEMPLATE.GDT 4/29/13

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** | SHEET NO. **1** OF **2**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-204** / **DRAFT**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)
					SURFACE ELEVATION +8,866.0 Feet (Continued)		
					No sampling from 25.5'-31.5'		
31.5					31.5		
					End of boring @ 31.5'. Boring advanced with sonic equipment and mud rotary techniques to 25.5 feet. Boring advanced to 31.5' with mud rotary techniques. Piezometer installed with tip at 31.5 feet.		

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING **1389122.482**	BORING STARTED **11/5/12**	AECOM OFFICE **Denver**	
EASTING **2268373.787**	BORING COMPLETED **11/6/12**	ENTERED BY **AMH**	SHEET NO. **2** OF **2**
WL	RIG/FOREMAN **AMS Compact Sonic 10-C/Kyle King**	APP'D BY	AECOM JOB NO. **60239818**

AECOM LOG 60239818 RICO-UPDATED 4-8-13.GPJ FS_DATATEMPLATE.GDT 4/29/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-205**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
				SURFACE ELEVATION Feet	
				0.5 Topsoil	
	1	SON		Fill - 75% gravel, 22% sand, 3% fines - 10 YR 4/2	
				2.0	
	2	SON		Fill - 5% cobble, 20% gravel, 67% sand, 8% fines - 5 YR 3/2	
5.0				Large cobble	
				6.5	
				Colluvium - 10% cobble, 40% gravel, 40% sand, 10% fines - 10YR 4/4	
10.0	3	SON		Large cobble	
				14.0	
15.0				Colluvium - 50% gravel, 45% sand 5% fines - 5 YR 3/2	
	4	SON			
				17.5	
				25% cobble, 30% gravel, 30% sand, 15% fines - 10 YR 4/3	
				Water encountered during drilling - perched	
20.0					
	5A	SON			
				Perched water during drilling	
25.0					
				26.0	
				Colluvium - 20% cobble, 30% gravel, 40% sand, 10% fines - 10 YR 3/3	
30.0					
				. . . continued	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** | SHEET NO. **1** OF **6**

AECOM LOG 60239818 RICO-UPDATED 10-11-13.GPJ FS_DATATEMPLATE.GDT 10/15/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-205**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
				SURFACE ELEVATION Feet (Continued)	
	5B	SON		Colluvium - 20% cobble, 30% gravel, 40% sand, 10% fines - 10 YR 3/3	
35.0				35.0	
	6	SON		Colluvium - 10% cobble, 40% gravel, 45% sand, 5% fines, trace organics - 10 YR 2/2 Color change 5 YR 4/3	
				39.0	
	7	SON		Colluvium - 0% cobble, 15% gravel, 60% sand, 15% fines - 7.5 YR 3/2	
40.0				40.0	
	8	SON		Colluvium - 20% cobble, 40% gravel, 30% sand, 10% fines, trace organics - 2.5 YR 2.5/1 Significant black carbon content adhering to and staining individual particles Perched zone during drilling	
				42.0	
	9	SON		Significant black carbon content	
				44.0	
45.0				Colluvium - 15% cobble, 35% gravel, 40% sand, 10% fines - 5 YR 4/4	
				4.0-inch clayey zone	
	10	SON		Begin saturated zone 6.0-inch+ weathered sandstone cobble	
50.0				50.0	
				Alluvium/Colluvium Mix - 15% cobble, 45% gravel, 25% sand, 15% fines - 7.5 YR 4/4	
55.0					
	11	SON			
60.0					
				. . . continued	

AECOM LOG 60239818 RICO-UPDATED 10-11-13.GPJ FS_DATATEMPLATE.GDT 10/15/13

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818**

SHEET NO. **2** OF **6**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-205**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
				SURFACE ELEVATION Feet (Continued)	
65.0				Alluvium/Colluvium Mix - 15% cobble, 45% gravel, 25% sand, 15% fines - 7.5 YR 4/4 Become 7.5 YR 65.0	
	12A	SON		Severely weathered halo around dark gray limestone cobble at 65.0 feet 67.5	
	12B	SON		Alluvium - 0% cobble, 60% gravel, 40% sand, 5% fines - 5 YR 4/6 68.5 8.0-inch thick fine sand 70.0	
70.0					
	13	SON		Alluvium - 0% cobble, 5% gravel, 90% sand, 5% fines - 5 YR 4/4 75.0	
75.0					
	14	SON		Alluvium - 1% cobble, 10% gravel, 79% sand, 10% fines - 7.5 YR 5/4 77.5	
80.0				82.5	
				Alluvium - 0% cobble, 30% gravel, 65% sand, 5% fines - 5 YR 4/4	
85.0					
90.0				. . . continued	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** SHEET NO. **3** OF **6**

AECOM LOG 60239818 RICO-UPDATED 10-11-13.GPJ FS_DATATEMPLATE.GDT 10/15/13

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-205**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/(FT): 10 20 30 40 50

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
					SURFACE ELEVATION Feet (Continued)	
	15	SON			Alluvium - 0% cobble, 30% gravel, 65% sand, 5% fines - 5 YR 4/4	
95.0						
100.0					102.0	
					Alluvium - 5% gravel, 90% sand, 5% fines - 5 YR 4/2	
105.0						
	16	SON				
110.0					Scattered angular dark gray limestone gravel	
					Scattered gravels	
					Scattered angular dark gray limestone gravels	
115.0					115.0	
					2.0-inch gravels - color becomes mix of 16 17	
					117.0	
					Colluvium - 0% cobble, 30% gravel, 60% sand, 10% fines - 5 YR 3/2	
120.0	17	SON				
					. . . continued	

AECOM LOG 60239818 RICO-UPDATED 10-11-13.GPJ FS_DATATEMPLATE.GDT 10/15/13

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818**

SHEET NO. **4** OF **6**

AECOM	CLIENT: **Atlantic Richfield Company**	LOG OF BORING NUMBER: **MW-205**
	PROJECT NAME: **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER: **Anderson Engineering Company, Inc.**

SITE LOCATION: **Rico-Argentine**

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}: 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %: 10 20 30 40 50

STANDARD PENETRATION BLOWS/(FT): 10 20 30 40 50

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
				SURFACE ELEVATION Feet (Continued)	
				Colluvium - 0% cobble, 30% gravel, 60% sand, 10% fines - 5 YR 3/2	
				122.0	
				Weathered boulders 2 GLEY 5/1, calcareous sand stone and siltstone from 122.0 to 127.0 feet	
125.0					
				0.25 to 2.0 inch alluvial gravels, various sources, subangular to subrounded	
130.0					
				Weathered boulders 2 GLEY 5/1, calcareous sand stone and siltstone	
				134.0	
135.0				Alluvium/Talus - 5% cobble, 55% gravel, 35% sand, 5% fines - 1 GLEY 3/1 Well-rounded red sandstone cobble and severly weatehred grey limestone cobbles in soil matrix	
140.0	18	SON			
145.0					
150.0				150.0	
				. . . continued	

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60239818** SHEET NO. **5** OF **6**

AECOM LOG 60239818 RICO-UPDATED 10-11-13.GPJ FS_DATATEMPLATE.GDT 10/15/13

AECOM	CLIENT **Atlantic Richfield Company**	LOG OF BORING NUMBER **MW-205**
	PROJECT NAME **Rico - Argentine Mine Site**	ARCHITECT-ENGINEER **Anderson Engineering Company, Inc.**

SITE LOCATION **Rico-Argentine**

DEPTH(FT) / ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS/(FT) (10 20 30 40 50)
				SURFACE ELEVATION Feet (Continued)		
				End of Boring		

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

NORTHING	BORING STARTED	AECOM OFFICE **Denver**	
EASTING	BORING COMPLETED	ENTERED BY **CAH**	SHEET NO. **6** OF **6**
WL	RIG/FOREMAN **Boart/Longyear Sonic 300/Rick Mallet**	APP'D BY	AECOM JOB NO. **60239818**

AECOM LOG 60239818 RICO-UPDATED 10-11-13.GPJ FS_DATATEMPLATE.GDT 10/15/13

2. Test Pits

TP-2004A
TP-2004B
TP2011-AT1
TP2011-AT2
TP2011-AT3
TP2011-AT4
TP2011-AT5
TP2011-AT6
TP-17
TP-18
TP-22
TP-2013XX
TP-2013YY
TP-2013ZZ

ANDERSON

BORING LOG

PAGE _____ OF _____

PROJECT NAME: Rico Co PROJECT NO: St. Louis Park	BORING NUMBER: TP-17	COORDINATES OR LOCATION:
LOGGED BY: CA CHECKED BY:	SURFACE ELEVATION:	GWL DEPTH 0 No water (ENCOUNTERED) ~~(ENCOUNTERED)~~ GWL DEPTH (STATIC)
DRILLING METHOD: Backhoe Test Pit	HOLE DIAMETER: NA / FLUID USED: NA	DATE STARTED: 10-13-08 DATE COMPLETED: 10-13-08
CASING TYPE AND SIZE: NA SCREEN TYPE AND SIZE:		FROM _____ A.G.S TO _____ B.G.S. FROM _____ TO _____ B.G.S.

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION	WELL CONSTRUCTION SUMMARY
0.5						Ground on surface, Brown sandy silt with some clay and gravel and Rock (2" to 14") Rock content 25%	
1.0							
1.5							
2.0							
2.5	2.8						
3.0						very dark brown silty clay with organic material, little to no rock, soil moist	
3.5							
4.0	4.0						
4.5						Brown silty clay with some large rock (6" - 14") ~5% soil moist	
5.0							
5.5							
6.0	6.4						NO WATER ENCOUNTERED
6.5							
7.0							

NOTES

TD= _____

1) Test Pit Back filled & Compacted
2) Sample collected, Composit of Material

TP-17

ANDERSON

BORING LOG

PAGE _____ OF _____

PROJECT NAME: Rico CO PROJECT NO.: St. Louis Ponds	BORING NUMBER: TP-18	COORDINATES OR LOCATION:
LOGGED BY: RC CHECKED BY:	SURFACE ELEVATION:	GWL DEPTH 0 NO WATER (ENCOUNTERED) GWL DEPTH (STATIC)
DRILLING METHOD: Backhoe Test Pit	HOLE DIAMETER: NA FLUID USED: NA	DATE STARTED: 10-14-08 DATE COMPLETED: 10-14-08
CASING TYPE AND SIZE: SCREEN TYPE AND SIZE: NA		FROM _____ A.G.S TO _____ B.G.S. FROM _____ TO _____ B.G.S.

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION	WELL CONSTRUCTION SUMMARY
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0						Brown clayey silt with gravel and cobble (3" - >12" ø) ~10% rock moist	

TD= 7.0

NOTES

1) Test Pit Backfilled & Compacted

2. Sample collected, Composit of Material

ANDERSON

BORING LOG

PAGE 1 OF 1

PROJECT NAME: Rico, Co PROJECT NO. 57 LOUIS PONDS	BORING NUMBER: TP-22	COORDINATES OR LOCATION:
LOGGED BY: KC/CS CHECKED BY:	SURFACE ELEVATION:	GWL DEPTH No water (ENCOUNTERED) GWL DEPTH (STATIC)
DRILLING METHOD: Back hoe Test Pit	HOLE DIAMETER: NA / FLUID USED: NA	DATE STARTED: 10-13-08 DATE COMPLETED: 10-13-08
CASING TYPE AND SIZE: SCREEN TYPE AND SIZE: NA	FROM ____ A.G.S TO ____ B.G.S. FROM ____ TO ____ B.G.S. NA	

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION	WELL CONSTRUCTION SUMMARY
0.5	1					Crushed stone and solidified Red Sandy tailings - calcine	
1.0	1.0						
1.5	2					Orange Silty Sand with gravel & Cobbles - mine waste	
2.0	2.0						
2.5	3					Brown Silty sand with gravel and Cobbles	
3.0							
3.5							
4.0							
4.5							
5.0	5.0						
						TD ↑	Large rocks, could not remove - refusal
							No water encountered

NOTES

TD= 5.0

1) Steel pipe in trench, running N/S at 1.2' dep. Pipe 9" Ø
2) Test Pit Back Filled + Compacted
K - Sample collected, Composite of Material

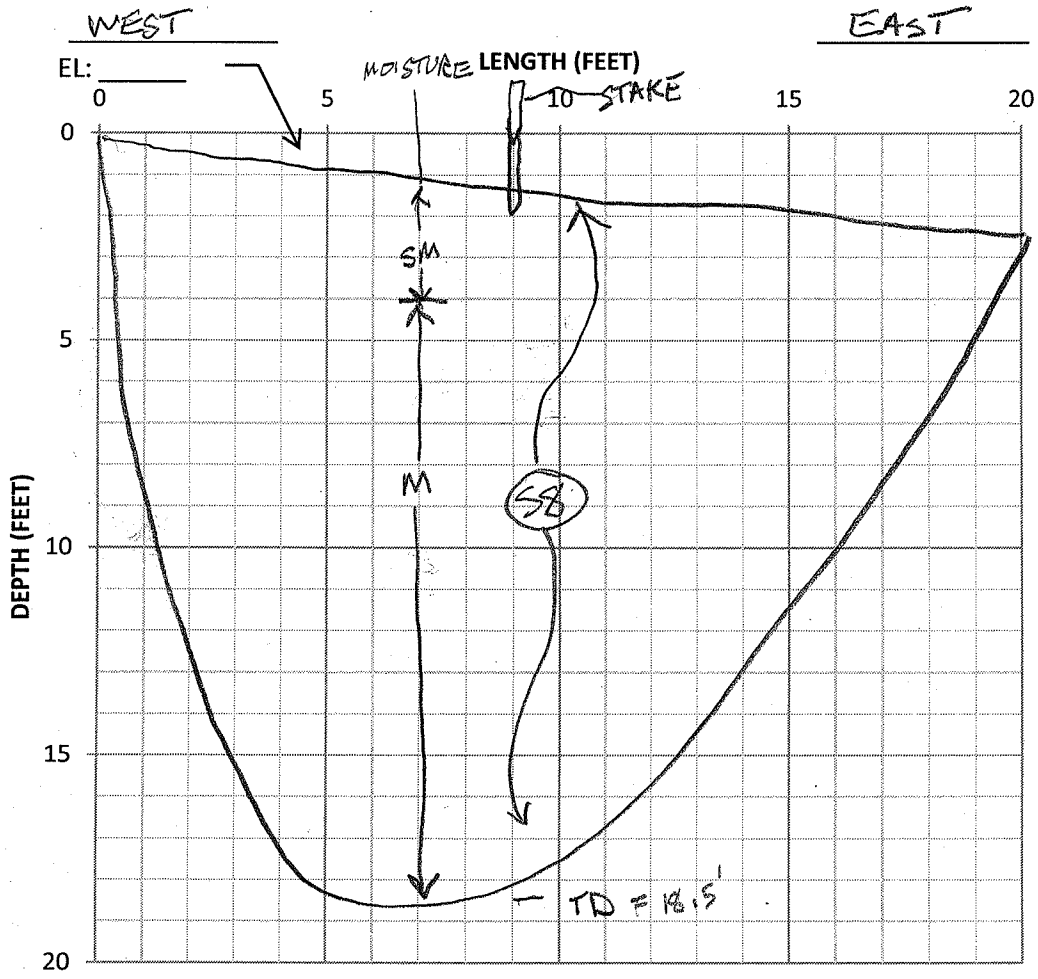
TEST PIT LOG

TEST PIT #: TP2013-6

PROJECT: Rico St. Louis Ponds
NO:
DATE: 23OCT13
LOGGED BY: ACJ

WEATHER: 60°F, CLEAR
EXCAVATION METHOD:
LOCATION: ST. LOUIS TUNNEL AREA, BETWEEN MW-204 AND CHV-10D

Start Time: 1215 End Time: 1315 Note:



NOTES/SAMPLES

SAMPLES:
(B) 0-18.5' 3 5 GAL BUCKETS

SOIL TYPE	SOIL DESCRIPTION
(1)	
(SB)	COLLUVIUM

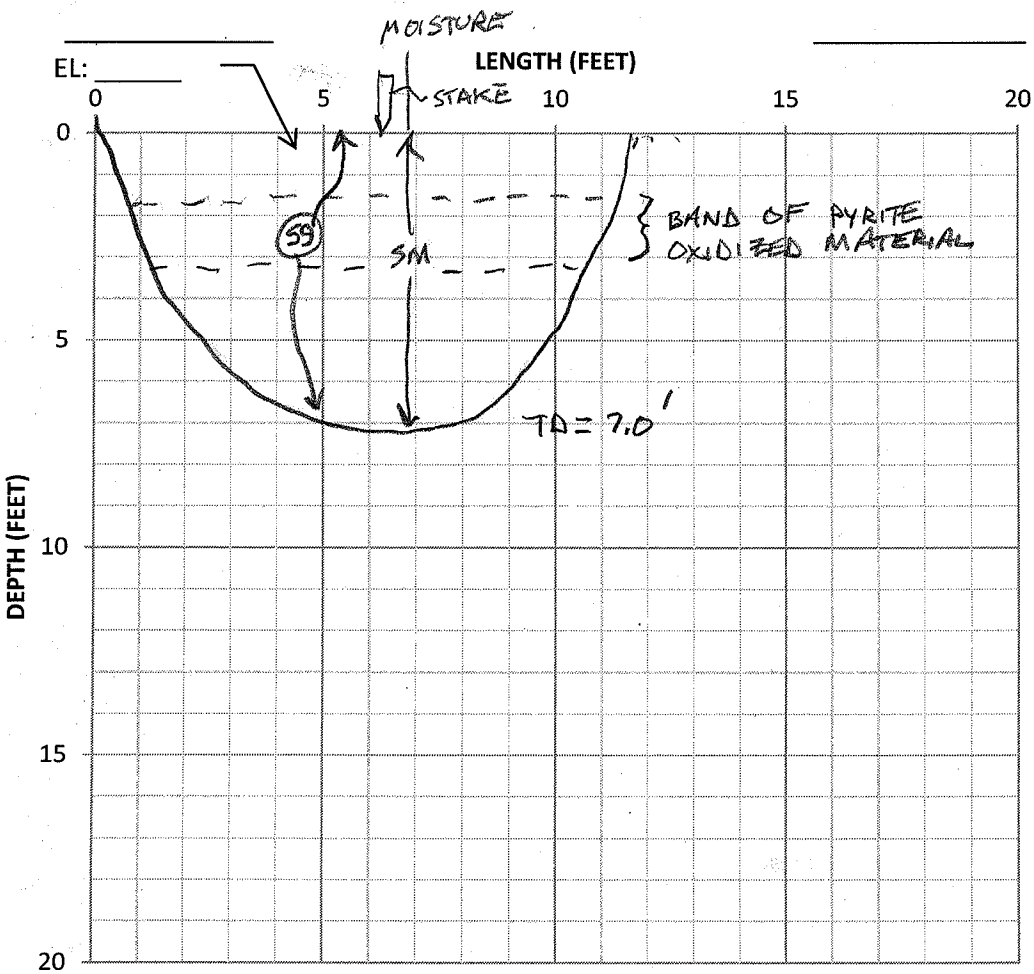
TEST PIT LOG

TEST PIT #: TP 2013-7

PROJECT: Rico St. Louis Ponds
DATE: 23 OCT 13
NO:
LOGGED BY: ACJ

WEATHER: 60°F CLEAR
EXCAVATION METHOD: KOMATSU PC300LC
LOCATION: STA 0+50 ON ST. LOUIS TUNNEL COLLAPSED ADIT ACCESS

Start Time: 1330 End Time: 1430 Note:



NOTES/SAMPLES

NO PLACE TO STOCKPILE MATL LIMITS DEPTH TO 7.0 FEET

SAMPLES:
(S) 0-7.5' 3 5GAL BUCKETS

SOIL TYPE	SOIL DESCRIPTION
(M)	
(S9)	FILL, WITH OXIDIZED WASTE ROCK

TP 2013-8

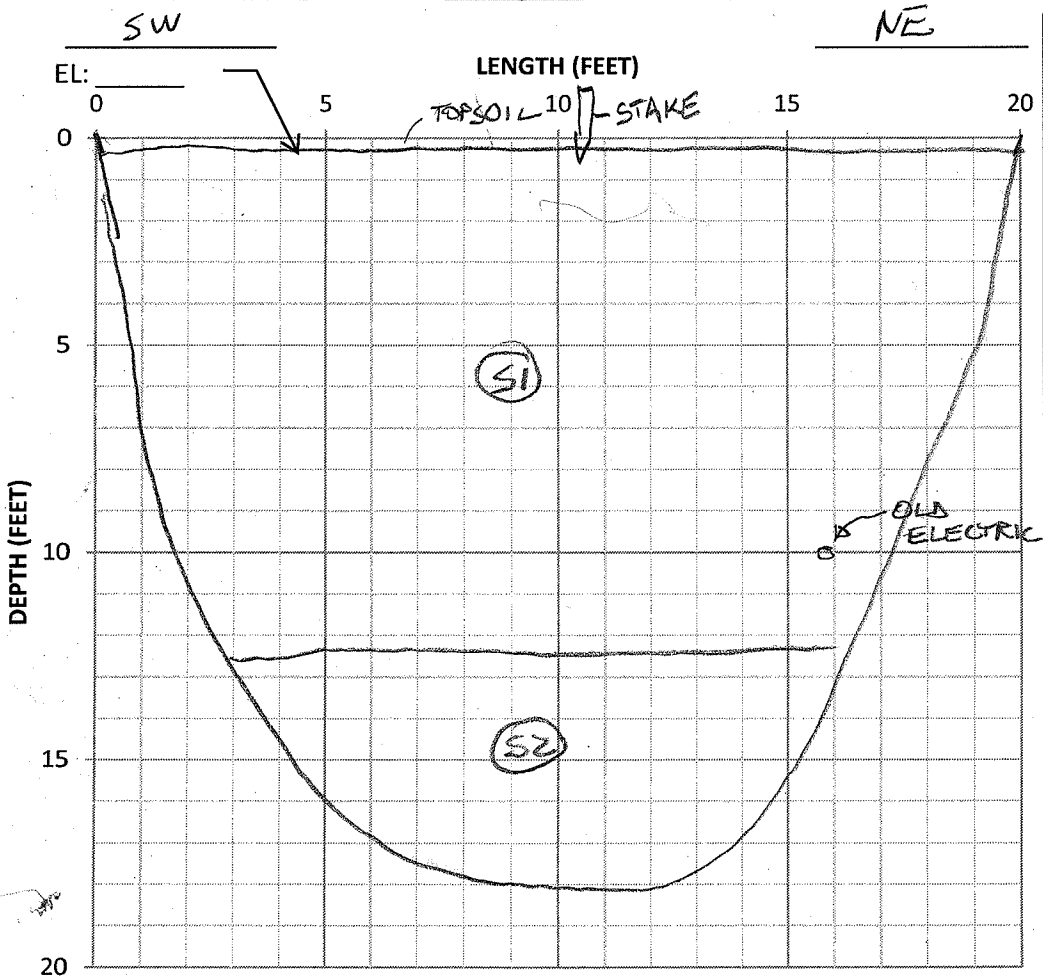
TEST PIT LOG

TEST PIT #: ~~2013~~ ~~SSR-1~~

PROJECT: Rico St. Louis Ponds
DATE: 22 OCT 13
NO: ~~2013-SSR-1~~
LOGGED BY: ACJ

WEATHER: CLEAR, 40°
EXCAVATION METHOD: KOMATSU PC300
LOCATION: 150' EAST OF LIME PLANT BLDG

Start Time: 1030 End Time: 1145 Note:



NOTES/SAMPLES

OLD FOUNDATION'S ENCOUNTERED 10' SW @ 3' DEEP, MOVED 10' NE

SM (SLIGHT MOIST)

MOIST

3 BUCKETS S1: 1'-12.5'
3 BUCKETS S2: 12.5'-18'

SOIL TYPE	SOIL DESCRIPTION (SEE ATTACHED SHEET)
A, B, S1, S2	TOPSOIL SEE S2 (FILL) ~~COLLUVIUM~~ (SEE S3) FILL (WASTE ROCK) S1: FILL, WASTE ROCK, NOT OXIDIZED, SOME SCATTERED WOODY PLANT DEBRIS S2: FILL, WASTE ROCK, OXIDIZED (PYRITE OXIDATION) ROCK SCATTERED

VARIOUS 2013 TEST PITS

SOIL DESCRIPTION DETAIL

HOLE: ~~2013-SSR-1~~ SHEET 1 OF ___

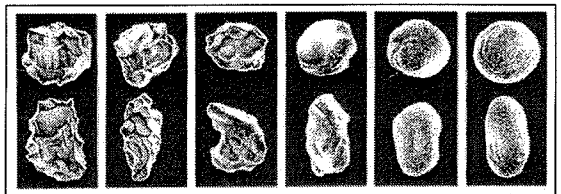
NUMBER	DESCRIPTION: MUNSELL COLOR (MOIST)	HCL Reaction (N, W, S)	MATERIAL SOURCE	Structure (Fabric)	PARTICLE SIZE, COMPOSITION AND SHAPE: Max Particle Size (inch)	Visual estimate % by dry weight (max part. size): Boulder (12"+)	Cobble (3"-12")	305 mm	76 mm	Sand: Coarse	Sand: Medium	Sand: Fine	Fines	Organics	Angularity (check or shade proportional to content): Very angular	Angular	Sub-Angular	Sub-rounded	Rounded	Well Rounded	PARTICLE SHAPE VISUAL (AND ASTM D2488): Cylindrical (L/W>3)	Discoidal (W/T>3)	Spherical	Tabular (W/T>3)	Ellipsoidal (W/T>3)	Equant	Irregular	CLASS: Plasticity Fines: NP=Non-Plastic, L=Low, M=Medium, H=High	USCS	COMMENTS
S1	5YR 3/2	N	F	STR	32	5	15	20	15	15	15	15	0		←	→							X		X		L	SM	80% SILT FINES
S2	10YR 4/3	W	F	STR	29	5	25	25	12	11	11	10	0		←	→							X		X		L	GW-GM	" " "
S3	7.5YR 3/3	W	F	HOM	36	5	15	25	15	10	10	15	0		←	→							X		X		M	GM-GC	50% SILT FINES
S4	7.5YR 5/2	W	F	HOM	18	2	10	33	15	15	15	10	0		←	→							X		X		L	GW-GM	80% SILT FINES
S5	7.5YR 4/4	W	F	STR	29	5	20	30	12	12	14	8	0		←	→							X		X		NP	GW-GM	" " "
S6	—	—	F	—	36	50	40	2	2	2	2	2	0		←	→									X		NP	N/A	
S7	7.5YR 3/3	N	U	—	36	5	25	20	12	12	11	15	0		←	→							X		X		L	GC	50% SILT FINES
S8	7.5YR 4/3	W	C	STR	30	5	20	30	10	10	10	15	0		←	→							X		X		M	GW-GC	80% CLAY FINES
S9	7.5YR 3/3	W	F	STR	15	2	25	25	12	12	11	13	0		←	→							X		X		NP	GW-GM	90% SILT FINES
S10																															
S11																															
S12																															
S13																															
S14																															
S15																															
S16																															

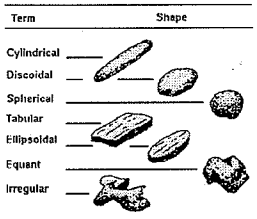
Field methods to describe plasticity (FHWA, 2002b)

Plasticity Range	Adjective	Dry Strength	Smear Test	Thread Smallest Diameter, in (mm)
0	Nonplastic	none - crumbles into powder with mere pressure	gritty or rough	ball cracks
1 - 10	low plasticity	low - crumbles into powder with some finger pressure	rough to smooth	1/4 – 1/8 (6 to 3)
>10 - 20	medium plasticity	medium - breaks into pieces or crumbles with considerable finger pressure	smooth and dull	1/16 (1.5)
>20 - 40	high plasticity	high - cannot be broken with finger pressure; spec. will break into pieces between thumb and a hard surface	Shiny	0.03 (0.75)
>40	very plastic	very high - can't be broken between thumb and a hard surface	very shiny and waxy	0.02 (0.5)

MATERIAL SOURCES
F=Fill
A=Alluvium
AF=Alluvial Fan
E=Eolian
L=Landslide
C=Colluvium
WB=Weath Bedrk
U = Unknown

STRUCTURE (ASTM D2488)
STR=Stratified (Layers >6mm)
LAM=Laminated
FIS=Fissured
SLK=Slickenside
BLK=Blocky
LEN=Lensed
HOM=Homogeneous





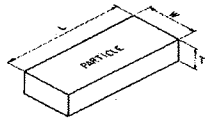


TABLE 12 Identification of Inorganic Fine-Grained Soils from Manual Tests

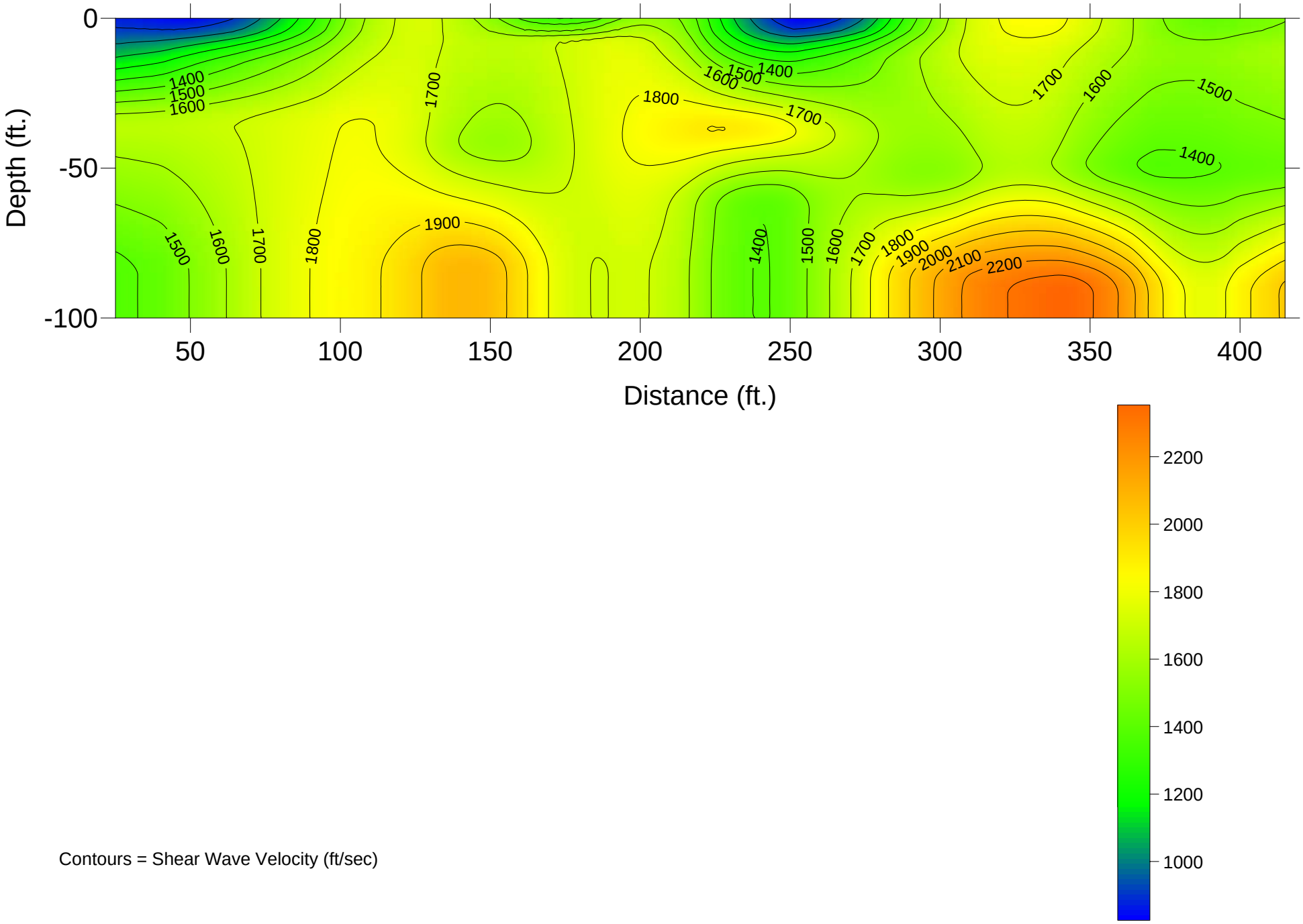
Soil Symbol	Dry Strength	Dilatancy	Toughness and Plasticity
ML	None to low	Slow to rapid	Low or thread cannot be formed
CL	Medium to high	None to slow	Medium
MH	Low to medium	None to slow	Low to medium
CH	High to very high	None	High

3. Surface Geophysical Surveys

Refraction Microtremor

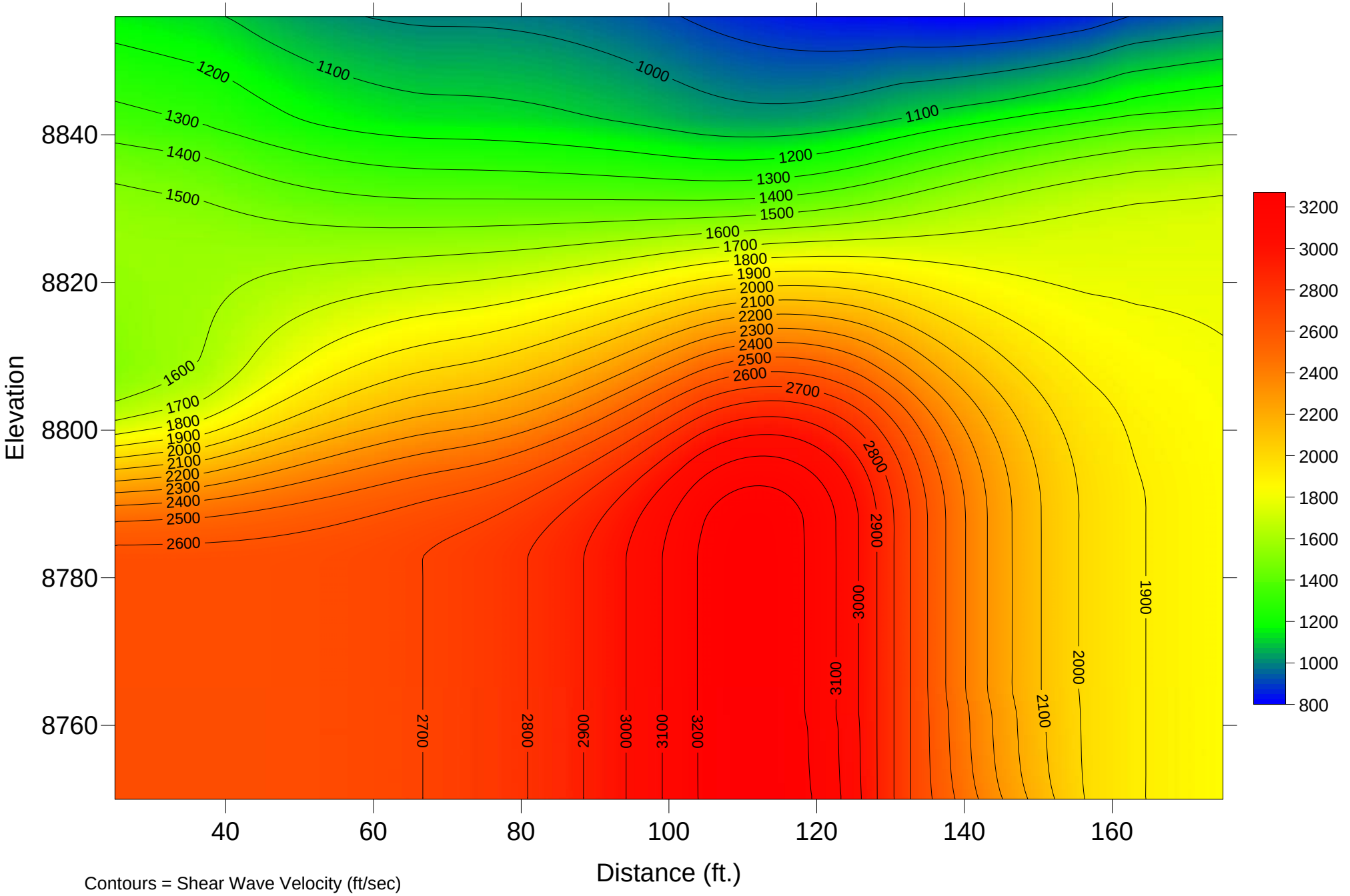
RM-201
RM-202
RM-203
RM-204
RM-205A
RM-205B
RM-205C

Refraction Microtremor Line RM-201

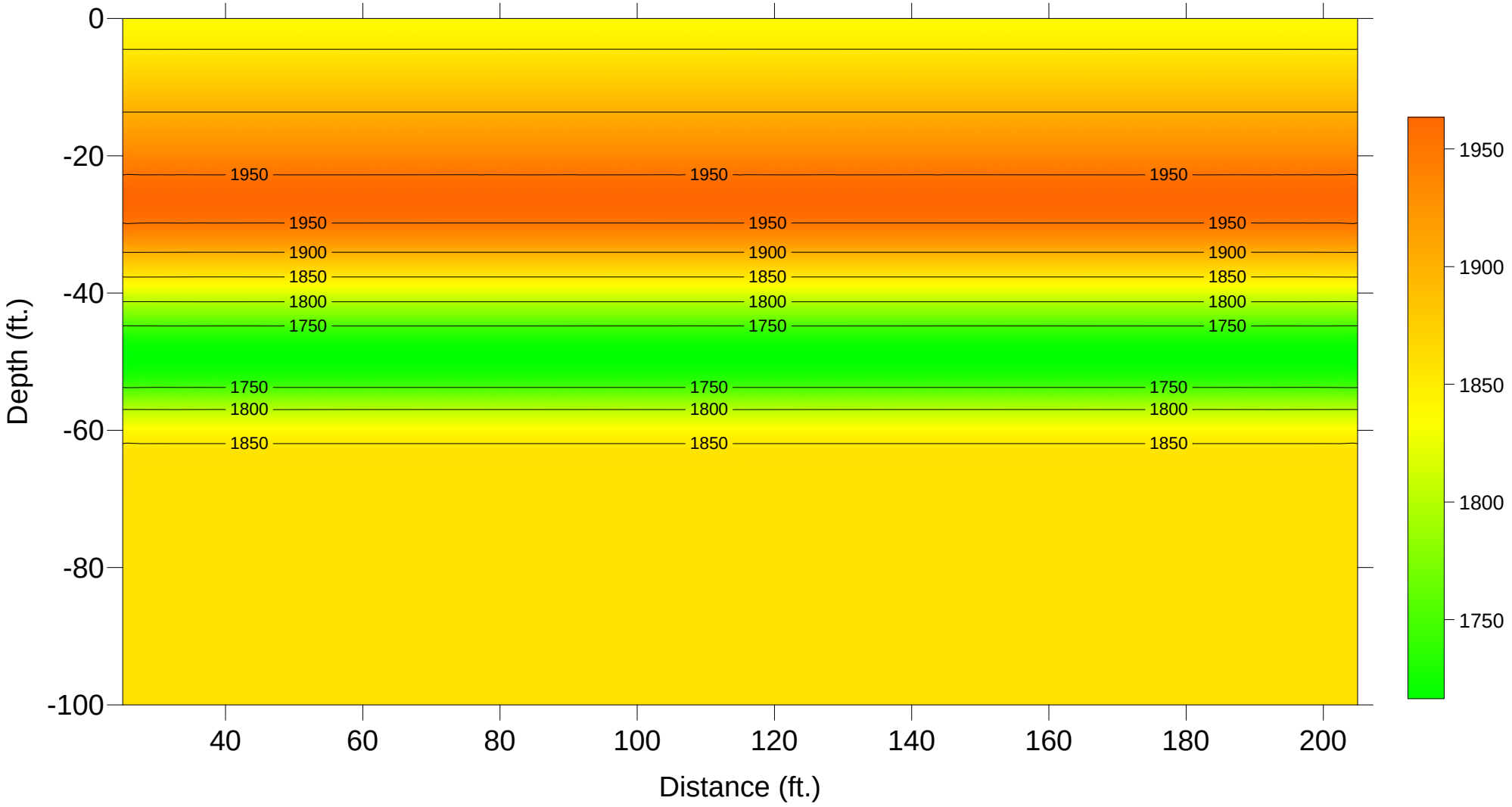


Contours = Shear Wave Velocity (ft/sec)

Refraction Microtremor Line RM-202

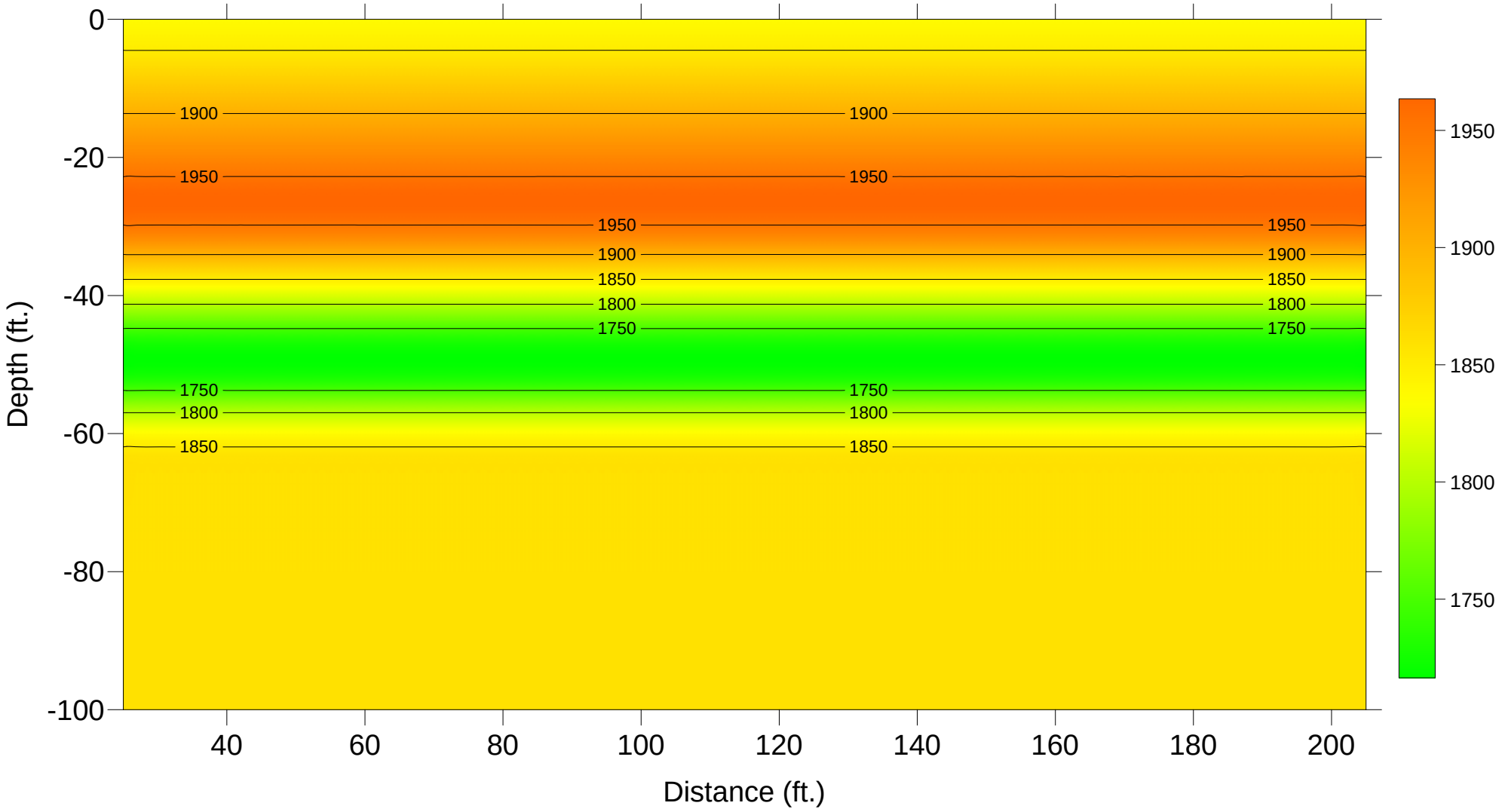


Refraction Microtremor Line RM-203



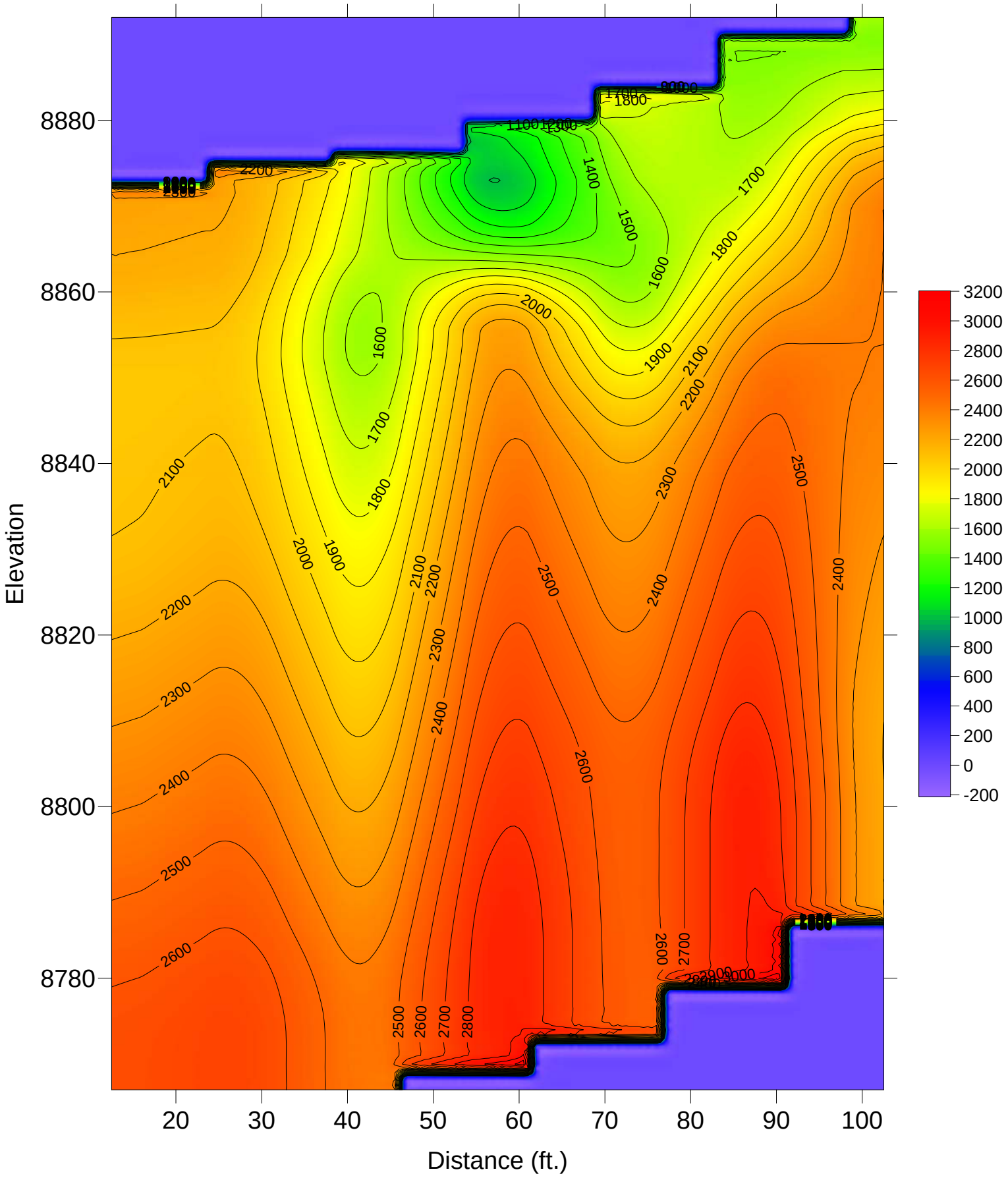
Contours = Shear Wave Velocity (ft/sec)

Refraction Microtremor Line RM-204



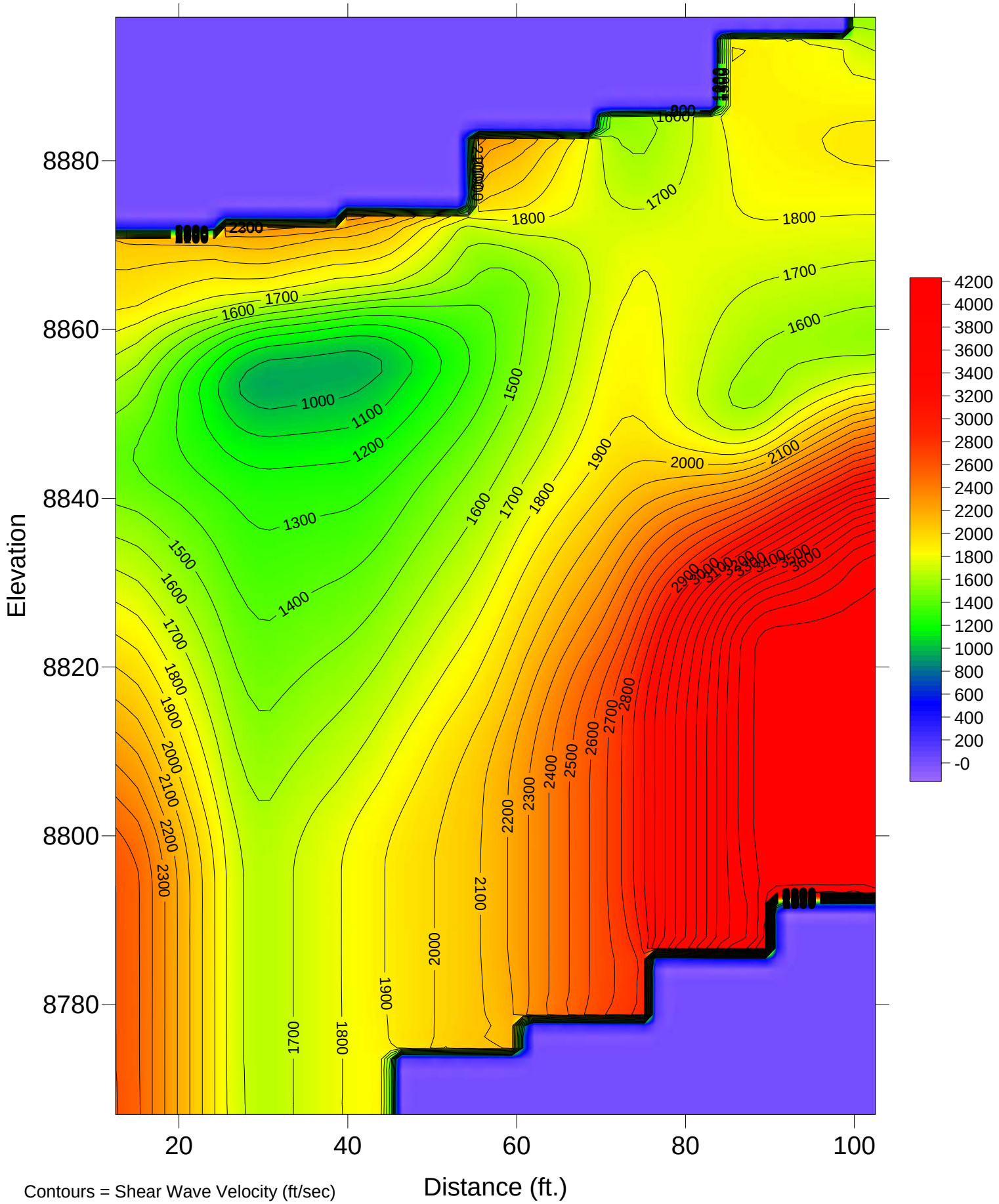
Contours = Shear Wave Velocity (ft/sec)

Refraction Microtremor Line RM-205A



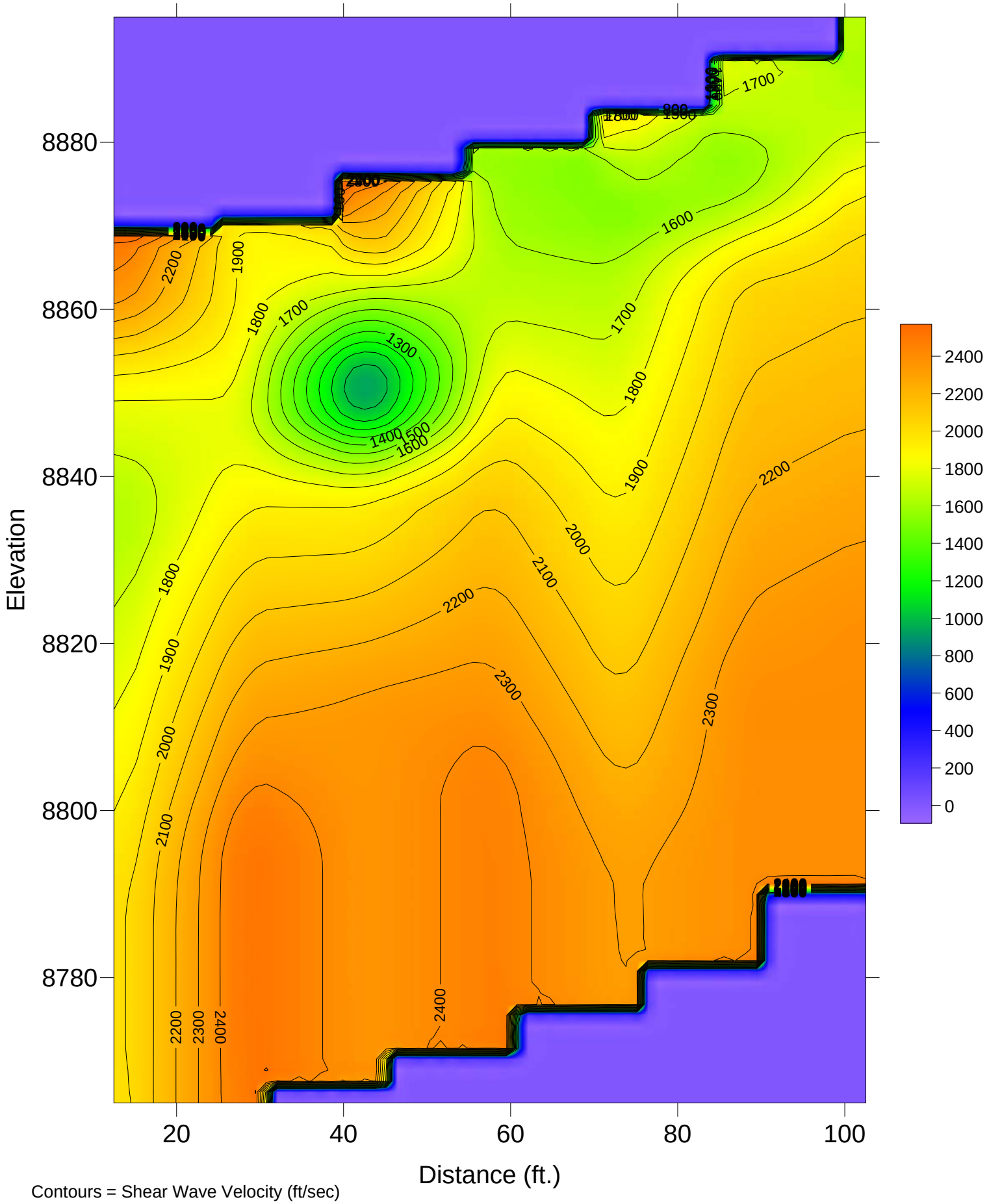
Contours = Shear Wave Velocity (ft/sec)

Refraction Microtremor Line RM-205B



Contours = Shear Wave Velocity (ft/sec)

Refraction Microtremor Line RM-205C



Contours = Shear Wave Velocity (ft/sec)

Appendix B: Geotechnical Testing

Soils Testing

1. **Samples from Borings**
2. **Samples from Test Pits**

Soils Testing

1. Samples from Borings

AT-2
BAH-01
CHV-101D
CHV-101S
EW-1
EW-2A
MW-201
MW-202
MW-203
MW-204
MW-205
MW-206
MW-207
SSR-103
St. LOUIS ADIT

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

LABORATORY REPORT

Client **ANDERSON ENGINEERING COMPANY, INC.**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-13-12**
Job No. **3151JM098**
Event / Invoice No. **31520185-25** Lab No.
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **11-02-12**
Submitted By **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS REMOVAL & DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **VARIOUS**
Sample Source / Location **CHV-101S**
Reference: **ASTM**
Special Instructions:

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **10-27-12**

TEST RESULTS

ELEVATION (FT)	MOISTURE CONTENT (%)	ATTERBERGS:	LL	PL	PI	ORGANIC CONTENT (%)
2.5-4'	12.5					
5-6.5'	11.9					
7.5-9'	7.9					
10-11.5'	8.8					
12.5-14'	14.9		NV	NV	NP	
15-16.5'	14.8					
17.5-19'	12.0		NV	NV	NP	
20-21.5'	12.9					
22.5-23.5'	15.9		NV	NV	NP	
27.5-29'	9.8					
30-31.5'	11.8					
45-46.5'	10.3					

Comments: **SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATIONS**

Copies To: **CLIENT (2)**

450@95WTI
092899

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-13-12**
Job No. **3151JM098**
Event / Invoice No. **315200185-25** Lab No. **0981118-**
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **11-02-12**
Submitted By **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS**
Contractor **FLARE CONSTRUCTION**
Type / Use of Aggregate **VARIABLE**
Sample Source / Location **CHV-101S 2.5-4'**
Special Instructions: **0981118-1**

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **11-02-12**

TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27

SIEVE SIZE U.S. - MM	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN. -100.0		
3 - 75.0		
2 - 50.0		
1 1/2 - 37.5		
1 1/4 - 31.5		
1 - 25.0		
3/4 - 19.0	100	
1/2 - 12.5	95	
3/8 - 9.5	86	
1/4 - 6.3	81	
NO. 4 - 4.75	76	
8 - 2.36	67	
10 - 2.00	65	
16 - 1.18	60	
30 - .600	52	
40 - .425	49	
50 - .300	45	
100 - .150	36	
FINER THAN NO. 200 ☒ ASTM C117 ☐ AASHTO T11	29.6	

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90

METHOD ☐ A ☐ B	RESULT	SPECIFICATION
LIQUID LIMIT		
PLASTIC LIMIT		
PLASTICITY INDEX		
SAMPLE AIR DRIED ☐ YES ☐ NO		

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES ☐ ASTM C40 ☐ AASHTO T21
ORGANIC PLATE NO. →

CARBONATES IN AGGREGATE
☐ ARIZ 238 ☐ ASTM D3042 % →

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS ☐ ASTM C29 ☐ AASHTO T19 ☐ RODDING ☐ JIGGING ☐ LOOSE	FINE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
	COARSE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 AGGREGATE DRIED ☐ YES ☐ NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85 AGGREGATE DRIED ☐ YES ☐ NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176		% →		
RESISTANCE TO DEGRADATION SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96 GRADING		100 REV., % LOSS →		
		500 REV., % LOSS →		
LARGE COARSE AGGREGATE ☐ ASTM C535 GRADING		200 REV., % LOSS →		
		1000 REV., % LOSS →		
LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
FRACTURED FACES ☐ ASTM D5821 ☐ FLH T507 ☐ FAA ☐	COARSE AGGREGATE BY WEIGHT	ONE OR MORE FACES, % →		
		TWO OR MORE FACES, % →		
DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210 PROCEDURE: A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE		D_c →		
		D_f →		
UNCOMPACTED VOID CONTENT ☐ ASTM C1252 ☐		% →		
FLAT & ELONGATED PARTICLES ☐ ASTM D4791 ☐ DIMENSIONAL RATIO USED ☐ 1:2 ☐ 1:3 ☐ 1:5 ☐		BY WEIGHT, % →		
		BY NUMBER, % →		

Comments:

Copies To: **CLIENT (2) - ELECTRONIC**

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF AGGREGATES

Date of Report **12-13-12**

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Job No. **3151JM098**
Event / Invoice No. **315200185-25** Lab No. **0981118-**
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **11-02-12**
Submitted By **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS**
Contractor **FLARE CONSTRUCTION**
Type / Use of Aggregate **VARIABLE**
Sample Source / Location **CHV-101S 12.5-14'**
Special Instructions: **0981118-5**

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **11-02-12**

TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27

SIEVE SIZE U.S. - MM	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN. - 100.0		
3 - 75.0		
2 - 50.0		
1 1/2 - 37.5		
1 1/4 - 31.5		
1 - 25.0	100	
3/4 - 19.0	94	
1/2 - 12.5	84	
3/8 - 9.5	78	
1/4 - 6.3	66	
NO. 4 - 4.75	60	
8 - 2.36	50	
10 - 2.00	47	
16 - 1.18	42	
30 - .600	35	
40 - .425	33	
50 - .300	29	
100 - .150	23	
FINER THAN NO. 200 ☒ ASTM C117 ☐ AASHTO T11	17.4	

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90

METHOD ☐ A ☐ B	RESULT	SPECIFICATION
LIQUID LIMIT		
PLASTIC LIMIT		
PLASTICITY INDEX		
SAMPLE AIR DRIED ☐ YES ☐ NO		

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES ☐ ASTM C40 ☐ AASHTO T21
ORGANIC PLATE NO. →

CARBONATES IN AGGREGATE
☐ ARIZ 238 ☐ ASTM D3042 % →

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS ☐ ASTM C29 ☐ AASHTO T19 ☐ RODDING ☐ JIGGING ☐ LOOSE	FINE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
	COARSE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 AGGREGATE DRIED ☐ YES ☐ NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85 AGGREGATE DRIED ☐ YES ☐ NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176		% →		
RESISTANCE TO DEGRADATION SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96 GRADING		100 REV., % LOSS →		
		500 REV., % LOSS →		
LARGE COARSE AGGREGATE ☐ ASTM C535 GRADING		200 REV., % LOSS →		
		1000 REV., % LOSS →		
LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
FRACTURED FACES ☐ ASTM D5821 ☐ FLH T507 ☐ FAA ☐	COARSE AGGREGATE BY WEIGHT	ONE OR MORE FACES, % →		
		TWO OR MORE FACES, % →		
DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210 PROCEDURE: A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE		D_c →		
		D_f →		
UNCOMPACTED VOID CONTENT ☐ ASTM C1252 ☐		% →		
FLAT & ELONGATED PARTICLES ☐ ASTM D4791 ☐ DIMENSIONAL RATIO USED ☐ 1:2 ☐ 1:3 ☐ 1:5 ☐		BY WEIGHT, % →		
		BY NUMBER, % →		

Comments:

Copies To: **CLIENT (2) - ELECTRONIC**

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-13-12**
Job No. **3151JM098**
Event / Invoice No. **315200185-25** Lab No. **0981118-**
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **11-02-12**
Submitted By **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS**
Contractor **FLARE CONSTRUCTION**
Type / Use of Aggregate **VARIABLE**
Sample Source / Location **CHV-101S 7.5-9'**
Special Instructions: **0981118-3**

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **11-02-12**

TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27

SIEVE SIZE U.S. - MM	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN. - 100.0		
3 - 75.0		
2 - 50.0		
1 1/2 - 37.5		
1 1/4 - 31.5		
1 - 25.0		
3/4 - 19.0		
1/2 - 12.5		
3/8 - 9.5		
1/4 - 6.3		
NO. 4 - 4.75		
8 - 2.36		
10 - 2.00		
16 - 1.18		
30 - .600		
40 - .425		
50 - .300		
100 - .150		
FINER THAN NO. 200 ☒ ASTM C117 ☐ AASHTO T11	13.8	

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD ☐ A ☐ B

	RESULT	SPECIFICATION
LIQUID LIMIT		
PLASTIC LIMIT		
PLASTICITY INDEX		

SAMPLE AIR DRIED ☐ YES ☐ NO

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES ☐ ASTM C40 ☐ AASHTO T21
ORGANIC PLATE NO. →

CARBONATES IN AGGREGATE
☐ ARIZ 238 ☐ ASTM D3042 % →

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS ☐ ASTM C29 ☐ AASHTO T19 ☐ RODDING ☐ JIGGING ☐ LOOSE	FINE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
	COARSE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION	FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 AGGREGATE DRIED ☐ YES ☐ NO	BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
	COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85 AGGREGATE DRIED ☐ YES ☐ NO	BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176		% →		
RESISTANCE TO DEGRADATION	SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96 GRADING	100 REV., % LOSS →		
		500 REV., % LOSS →		
	LARGE COARSE AGGREGATE ☐ ASTM C535 GRADING	200 REV., % LOSS →		
		1000 REV., % LOSS →		
LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
FRACTURED FACES ☐ ASTM D5821 ☐ FLH T507 ☐ FAA ☐	COARSE AGGREGATE BY WEIGHT	ONE OR MORE FACES, % →		
		TWO OR MORE FACES, % →		
DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210 PROCEDURE: A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE		D_c →		
		D_f →		
UNCOMPACTED VOID CONTENT ☐ ASTM C1252 ☐		% →		
FLAT & ELONGATED PARTICLES ☐ ASTM D4791 ☐ DIMENSIONAL RATIO USED ☐ 1:2 ☐ 1:3 ☐ 1:5 ☐		BY WEIGHT, % →		
		BY NUMBER, % →		

Comments:

Copies To: **CLIENT (2) - ELECTRONIC**

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF AGGREGATES

Date of Report **12-13-12**

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Job No. **3151JM098**
Event / Invoice No. **315200185-25** Lab No. **0981118-**
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **11-02-12**
Submitted By **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS**
Contractor **FLARE CONSTRUCTION**
Type / Use of Aggregate **VARIABLE**
Sample Source / Location **CHV-101S 27.5-29'**
Special Instructions: **0981118-10**

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **11-02-12**

TEST RESULTS

SIEVE ANALYSIS [X] ASTM C136 [ ] AASHTO T27

SIEVE SIZE U.S. - MM	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN. -100.0		
3 - 75.0		
2 - 50.0		
1 1/2 - 37.5		
1 1/4 - 31.5		
1 - 25.0		
3/4 - 19.0		
1/2 - 12.5		
3/8 - 9.5		
1/4 - 6.3		
NO. 4 - 4.75		
8 - 2.36		
10 - 2.00		
16 - 1.18		
30 - .600		
40 - .425		
50 - .300		
100 - .150		
FINER THAN NO. 200 [X] ASTM C117 [ ] AASHTO T11	**14.0**	

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
[ ] ASTM D4318 [ ] AASHTO T89 & T90

METHOD [ ] A [ ] B	RESULT	SPECIFICATION
LIQUID LIMIT		
PLASTIC LIMIT		
PLASTICITY INDEX		
SAMPLE AIR DRIED [ ] YES [ ] NO		

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES [ ] ASTM C40 [ ] AASHTO T21
ORGANIC PLATE NO. →

CARBONATES IN AGGREGATE
[ ] ARIZ 238 [ ] ASTM D3042 % →

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS [ ] ASTM C29 [ ] AASHTO T19 [ ] RODDING [ ] JIGGING [ ] LOOSE	FINE AGGREGATE	UNIT WEIGHT, PCF → VOIDS, % →		
	COARSE AGGREGATE	UNIT WEIGHT, PCF → VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION	FINE AGGREGATE [ ] ASTM C128 [ ] AASHTO T84 AGGREGATE DRIED [ ] YES [ ] NO	BULK SPECIFIC GRAVITY → BULK SPECIFIC GRAVITY (SSD) → APPARENT SPECIFIC GRAVITY → ABSORPTION, % →		
	COARSE AGGREGATE [ ] ASTM C127 [ ] AASHTO T85 AGGREGATE DRIED [ ] YES [ ] NO	BULK SPECIFIC GRAVITY → BULK SPECIFIC GRAVITY (SSD) → APPARENT SPECIFIC GRAVITY → ABSORPTION, % →		
SAND EQUIVALENT VALUE [ ] ASTM D2419 [ ] AASHTO T176		% →		
RESISTANCE TO DEGRADATION [ ] ASTM C131 [ ] AASHTO T96	SMALL COARSE AGGREGATE GRADING	100 REV., % LOSS → 500 REV., % LOSS →		
[ ] ASTM C535	LARGE COARSE AGGREGATE GRADING	200 REV., % LOSS → 1000 REV., % LOSS →		
LIGHTWEIGHT PIECES [ ] ASTM C123 [ ] AASHTO T113		FINE AGGREGATE, % → COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES [ ] ASTM C142 [ ] AASHTO T112		FINE AGGREGATE, % → COARSE AGGREGATE, % →		
FRACTURED FACES [ ] ASTM D5821 [ ] FLH T507 [ ] FAA [ ]	COARSE AGGREGATE BY WEIGHT	ONE OR MORE FACES, % → TWO OR MORE FACES, % →		
DURABILITY INDEX [ ] ASTM D3744 [ ] AASHTO T210 PROCEDURE: A [ ] COARSE B [ ] FINE C [ ] COARSE & FINE		D_c → D_f →		
UNCOMPACTED VOID CONTENT [ ] ASTM C1252 [ ]		% →		
FLAT & ELONGATED PARTICLES [ ] ASTM D4791 [ ] DIMENSIONAL RATIO USED [ ] 1:2 [ ] 1:3 [ ] 1:5 [ ]		BY WEIGHT, % → BY NUMBER, % →		

Comments:

Copies To: **CLIENT (2) - ELECTRONIC**

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF AGGREGATES

Date of Report **12-13-12**
Job No. **3151JM098**
Event / Invoice No. **315200185-25** Lab No. **0981118-**
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **11-02-12**
Submitted By **J. GISSEMAN** Date **11-14-12**

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project **RICO INITIAL SOLIDS**
Location **RICO, COLORADO**
Contractor **FLARE CONSTRUCTION**
Arch. / Engr. **ANDERSON ENGINEERING**
Type / Use of Aggregate **VARIABLE**
Supplier / Source **BORINGS**
Sample Source / Location **CHV-101S 45-46.5'**
Source / Location Desig. By **CLIENT** Date **11-02-12**
Special Instructions: **0981118-12**

TEST RESULTS

SIEVE ANALYSIS [X] ASTM C136 [ ] AASHTO T27

SIEVE SIZE U.S. - MM	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN. -100.0		
3 - 75.0		
2 - 50.0		
1 1/2 - 37.5		
1 1/4 - 31.5		
1 - 25.0		
3/4 - 19.0		
1/2 - 12.5		
3/8 - 9.5		
1/4 - 6.3		
NO. 4 - 4.75		
8 - 2.36		
10 - 2.00		
16 - 1.18		
30 - .600		
40 - .425		
50 - .300		
100 - .150		
FINER THAN NO. 200 [X] ASTM C117 [ ] AASHTO T11	**15.3**	

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
[ ] ASTM D4318 [ ] AASHTO T89 & T90

METHOD [ ] A [ ] B	RESULT	SPECIFICATION
LIQUID LIMIT		
PLASTIC LIMIT		
PLASTICITY INDEX		
SAMPLE AIR DRIED [ ] YES [ ] NO		

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES [ ] ASTM C40 [ ] AASHTO T21
ORGANIC PLATE NO. →

CARBONATES IN AGGREGATE
[ ] ARIZ 238 [ ] ASTM D3042 % →

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS [ ] ASTM C29 [ ] AASHTO T19 [ ] RODDING [ ] JIGGING [ ] LOOSE	FINE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
	COARSE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION FINE AGGREGATE [ ] ASTM C128 [ ] AASHTO T84 AGGREGATE DRIED [ ] YES [ ] NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
COARSE AGGREGATE [ ] ASTM C127 [ ] AASHTO T85 AGGREGATE DRIED [ ] YES [ ] NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
SAND EQUIVALENT VALUE [ ] ASTM D2419 [ ] AASHTO T176		% →		
RESISTANCE TO DEGRADATION SMALL COARSE AGGREGATE [ ] ASTM C131 [ ] AASHTO T96 GRADING		100 REV., % LOSS →		
		500 REV., % LOSS →		
LARGE COARSE AGGREGATE [ ] ASTM C535 GRADING		200 REV., % LOSS →		
		1000 REV., % LOSS →		
LIGHTWEIGHT PIECES [ ] ASTM C123 [ ] AASHTO T113		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES [ ] ASTM C142 [ ] AASHTO T112		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
FRACTURED FACES [ ] ASTM D5821 [ ] FLH T507 [ ] FAA [ ]	COARSE AGGREGATE BY WEIGHT	ONE OR MORE FACES, % →		
		TWO OR MORE FACES, % →		
DURABILITY INDEX [ ] ASTM D3744 [ ] AASHTO T210 PROCEDURE: A [ ] COARSE B [ ] FINE C [ ] COARSE & FINE		D_c →		
		D_f →		
UNCOMPACTED VOID CONTENT [ ] ASTM C1252 [ ]		% →		
FLAT & ELONGATED PARTICLES [ ] ASTM D4791 [ ] DIMENSIONAL RATIO USED [ ] 1:2 [ ] 1:3 [ ] 1:5 [ ]		BY WEIGHT, % →		
		BY NUMBER, % →		

Comments:

Copies To: **CLIENT (2) - ELECTRONIC**

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **01-08-13**
Job No. **3151JM098**
Event / Invoice No. **31520185-20** Lab No. **0981113-2**
Authorized by **CHRIS SANCHEZ** Date **10-22-12**
Sampled by **CLIENT** Date **11-11-12**
Submitted by **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **1" MINUS CLAYEY SAND WITH GRAVEL**
Sample Source / Location **MW-202 SONIC, 1.5-12'**
Testing Authorized :
Special Instructions :

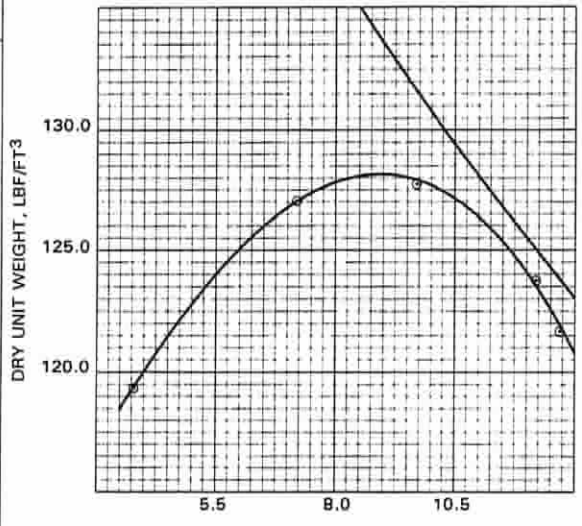
Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **11-11-12**

TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION
6		
5		
4		
3		
2		
1 1/2		
1	100	
3/4	97	
1/2	89	
3/8	79	
1/4	69	
No.4	65	
8	54	
10	53	
16	46	
30	41	
40	38	
50	35	
100	29	
200	25	

LABORATORY COMPACTION CHARACTERISTICS : AASHTO T99 METHOD C



SAMPLE PREPARATION: [X] WET [ ] DRY
RAMMER USED:
[X] 2 IN. CIRCULAR FACE [ ] OTHER
[ ] MECHANICAL [X] MANUAL

PROJECT PROCTOR ID: **1111**
MAXIMUM DENSITY, LBF/FT^3 → **128**
OPTIMUM MOISTURE CONTENT, % → **9**

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : **2.65**
ASSUMED ABSORPTION, % : **1.0**
% OVERSIZE IN LAB SAMPLE : **0**

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : **2.65**

TEST PROCEDURE	RESULT	SPECS
LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90 METHOD **B** LIQUID LIMIT → ESTIMATED % RETAINED ON NO. 40 **62** PLASTIC LIMIT → SAMPLE AIR DRIED [X] YES [ ] NO PLASTICITY INDEX →	30 21 9	
MOISTURE CONTENT : AASHTO T265 PORTION TESTED **FULL** % DRY WEIGHT →	20.9	
EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL : [ ] EXPANSION [ ] COMPRESSION, % → MAXIMUM SWELL PRESSURE, KSF → SURCHARGE, KSF INITIAL WATER CONTENT, % DRY DENSITY, PCF		

TEST PROCEDURE	RESULT	SPECS
RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION : GRADING 100 REV, % LOSS → GRADING 500 REV, % LOSS →		
SPECIFIC GRAVITY : MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C →		
pH DETERMINATION : pH →		
SOLUBLE SALTS : PPM →		
MINIMUM RESISTIVITY : OHM-CM →		

SOIL CLASSIFICATION : ASTM D2487
GROUP SYMBOL: **SC**
NAME: **CLAYEY SAND WITH GRAVEL**

Comments :

Copies to : **CLIENT (1)**

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

LABORATORY REPORT

Client **ANDERSON ENGINEERING COMPANY, INC.**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-11-12**
Job No. **3151JM098**
Event / Invoice No. **31520185-20** Lab No.
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **11-11-12**
Submitted By **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS REMOVAL & DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **VARIOUS**
Sample Source / Location **MW-202 SONIC**
Reference: **ASTM**
Special Instructions:

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **11-14-12** Date

TEST RESULTS

ELEVATION (FT)	MOISTURE CONTENT (%)	ATTERBERGS: LL	PL	PI	ORGANIC CONTENT (%)
0-1.5'	19.0				
1.5-6'	20.0				
6-9'	14.1				
9-12'	18.2				
12-18'	24.0				
18-23'	13.1				
23-30'	36.0				
30-35.5'	9.7				

Comments: **SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATIONS**

Copies To: **CLIENT (2)**

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-11-12**
Job No. **3151JM098**
Event / Invoice No. **315200185-20** Lab No. **0981113**
Authorized By **C. SANCHEZ** Date **10-24-12**
Sampled By **CLIENT** Date **11-11-12**
Submitted By **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS**
Contractor **FLARE CONSTRUCTION**
Type / Use of Aggregate **VARIABLE**
Sample Source / Location **MW-202 SONIC 0-1.5'**
Special Instructions: **0981113-1**

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **11-11-12**

TEST RESULTS

SIEVE ANALYSIS [X] ASTM C136 [ ] AASHTO T27

SIEVE SIZE U.S. - MM	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN. -100.0		
3 - 75.0		
2 - 50.0		
1 1/2 - 37.5		
1 1/4 - 31.5		
1 - 25.0	100	
3/4 - 19.0	63	
1/2 - 12.5	55	
3/8 - 9.5	51	
1/4 - 6.3	45	
NO. 4 - 4.75	43	
8 - 2.36	38	
10 - 2.00	37	
16 - 1.18	33	
30 - .600	30	
40 - .425	28	
50 - .300	26	
100 - .150	20	
FINER THAN NO. 200 [X] ASTM C117 [ ] AASHTO T11	13.0	

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
[ ] ASTM D4318 [X] AASHTO T89 & T90
METHOD [ ] A [X] B

	RESULT	SPECIFICATION
LIQUID LIMIT	NV	
PLASTIC LIMIT	NV	
PLASTICITY INDEX	NP	
SAMPLE AIR DRIED [X] YES [ ] NO		

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES [ ] ASTM C40 [ ] AASHTO T21
ORGANIC PLATE NO. →

CARBONATES IN AGGREGATE
[ ] ARIZ 238 [ ] ASTM D3042 % →

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS [ ] ASTM C29 [ ] AASHTO T19 [ ] RODDING [ ] JIGGING [ ] LOOSE	FINE AGGREGATE COARSE AGGREGATE	UNIT WEIGHT, PCF → VOIDS, % → UNIT WEIGHT, PCF → VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION	FINE AGGREGATE [ ] ASTM C128 [ ] AASHTO T84 AGGREGATE DRIED [ ] YES [ ] NO	BULK SPECIFIC GRAVITY → BULK SPECIFIC GRAVITY (SSD) → APPARENT SPECIFIC GRAVITY → ABSORPTION, % →		
	COARSE AGGREGATE [ ] ASTM C127 [ ] AASHTO T85 AGGREGATE DRIED [ ] YES [ ] NO	BULK SPECIFIC GRAVITY → BULK SPECIFIC GRAVITY (SSD) → APPARENT SPECIFIC GRAVITY → ABSORPTION, % →		
SAND EQUIVALENT VALUE [ ] ASTM D2419 [ ] AASHTO T176		% →		
RESISTANCE TO DEGRADATION [ ] ASTM C131 [ ] AASHTO T96	SMALL COARSE AGGREGATE GRADING	100 REV., % LOSS → 500 REV., % LOSS →		
[ ] ASTM C535	LARGE COARSE AGGREGATE GRADING	200 REV., % LOSS → 1000 REV., % LOSS →		
LIGHTWEIGHT PIECES [ ] ASTM C123 [ ] AASHTO T113		FINE AGGREGATE, % → COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES [ ] ASTM C142 [ ] AASHTO T112		FINE AGGREGATE, % → COARSE AGGREGATE, % →		
FRACTURED FACES [ ] ASTM D5821 [ ] FLH T507 [ ] FAA [ ]	COARSE AGGREGATE BY WEIGHT	ONE OR MORE FACES, % → TWO OR MORE FACES, % →		
DURABILITY INDEX [ ] ASTM D3744 [ ] AASHTO T210 PROCEDURE: A [ ] COARSE B [ ] FINE C [ ] COARSE & FINE		D_c → D_f →		
UNCOMPACTED VOID CONTENT [ ] ASTM C1252 [ ]		% →		
FLAT & ELONGATED PARTICLES [ ] ASTM D4791 [ ] DIMENSIONAL RATIO USED [ ] 1:2 [ ] 1:3 [ ] 1:5 [ ]		BY WEIGHT, % → BY NUMBER, % →		

Comments:

Copies To: **CLIENT (2) - ELECTRONIC**

THE SERVICES REFERRED TO HEREIN WERE PERFORMED IN ACCORDANCE WITH THE STANDARD OF CARE PRACTICED LOCALLY FOR THE REFERENCED METHOD(S) AND RELATE ONLY TO THE CONDITION(S) OR SAMPLE(S) TESTED AS STATED HEREIN. WESTERN TECHNOLOGIES INC. MAKES NO OTHER WARRANTY OR REPRESENTATION, EXPRESSED OR IMPLIED, AND HAS NOT CONFIRMED INFORMATION INCLUDING SOURCE OF MATERIALS SUBMITTED BY OTHERS.

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-14-12**
Job No. **3151JM098**
Event / Invoice No. **31520185-20** Lab No. **0981113-2**
Authorized by **CHRIS SANCHEZ** Date **10-22-12**
Sampled by **CLIENT** Date **11-11-12**
Submitted by **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **1" MINUS CLAYEY SAND WITH GRAVEL**
Sample Source / Location **MW-202 SONIC, 1.5-6'**
Testing Authorized :
Special Instructions :

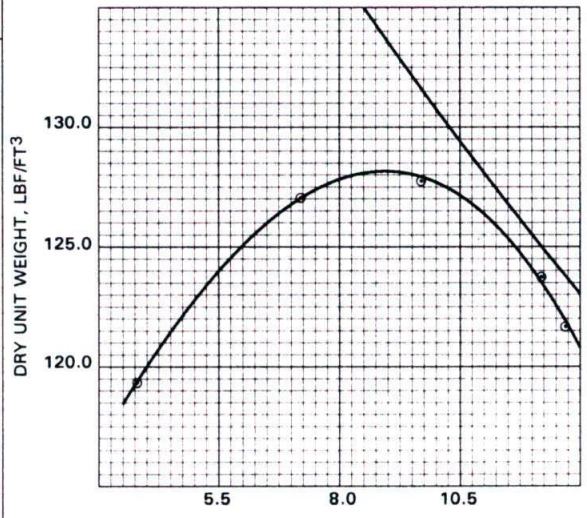
Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **11-11-12**

TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION
6		
5		
4		
3		
2		
1 1/2		
1	100	
3/4	97	
1/2	89	
3/8	79	
1/4	69	
No.4	65	
8	54	
10	53	
16	46	
30	41	
40	38	
50	35	
100	29	
200	25	

LABORATORY COMPACTION CHARACTERISTICS : AASHTO T99 METHOD **C**



SAMPLE PREPARATION: [X] WET [ ] DRY
RAMMER USED:
[X] 2 IN. CIRCULAR FACE [ ] OTHER
[ ] MECHANICAL [X] MANUAL

PROJECT PROCTOR ID: **1111**
MAXIMUM DENSITY, LBF/FT^3 → **128**
OPTIMUM MOISTURE CONTENT, % → **9**

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : **2.65**
ASSUMED ABSORPTION, % : **1.0**
% OVERSIZE IN LAB SAMPLE : **0**

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : **2.65**

TEST PROCEDURE	RESULT	SPECS
LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90		
METHOD **B** LIQUID LIMIT →	30	
ESTIMATED % RETAINED ON NO. 40 **62** PLASTIC LIMIT →	21	
SAMPLE AIR DRIED [X] YES [ ] NO PLASTICITY INDEX →	9	
MOISTURE CONTENT : AASHTO T265		
PORTION TESTED **FULL** % DRY WEIGHT →	20.9	
EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :		
[ ] EXPANSION [ ] COMPRESSION, % →		
MAXIMUM SWELL PRESSURE, KSF →		
SURCHARGE, KSF		
INITIAL WATER CONTENT, % DRY DENSITY, PCF		

TEST PROCEDURE	RESULT	SPECS
RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :		
GRADING 100 REV, % LOSS →		
GRADING 500 REV, % LOSS →		
SPECIFIC GRAVITY :		
MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C →		
pH DETERMINATION :		
pH →		
SOLUBLE SALTS :		
PPM →		
MINIMUM RESISTIVITY :		
OHM-CM →		

SOIL CLASSIFICATION : ASTM D2487
GROUP SYMBOL: **SC**
NAME: **CLAYEY SAND WITH GRAVEL**

Comments :

Copies to : **CLIENT (1)**

REVIEWED BY

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-14-12**
Job No. **3151JM098**
Event / Invoice No. **31520185-20** Lab No. **0981113-5**
Authorized by **CHRIS SANCHEZ** Date **10-22-12**
Sampled by **CLIENT** Date **11-11-12**
Submitted by **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **3/4" MINUS GRAVEL WITH SAND/CLAY**
Sample Source / Location **MW-202 SONIC, 12-30'**
Testing Authorized :
Special Instructions :

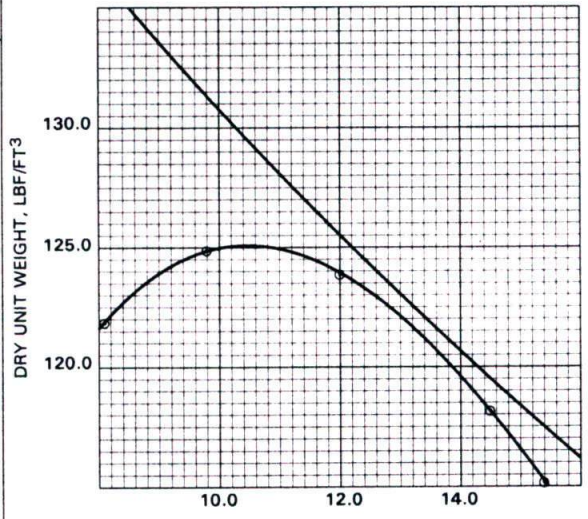
Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **11-11-12**

TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION
6		
5		
4		
3		
2		
1 1/2		
1		
3/4	100	
1/2	95	
3/8	91	
1/4	84	
No.4	80	
8	65	
10	62	
16	49	
30	37	
40	32	
50	26	
100	16	
200	9.3	

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD **C**



SAMPLE PREPARATION: [X] WET [ ] DRY
RAMMER USED:
[X] 2 IN. CIRCULAR FACE [ ] OTHER
[ ] MECHANICAL [X] MANUAL

PROJECT PROCTOR ID: **1112**
MAXIMUM DENSITY, LBF/FT3 → **125.1**
OPTIMUM MOISTURE CONTENT, % → **10.4**

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : **2.65**
ASSUMED ABSORPTION, % : **1.0**
% OVERSIZE IN LAB SAMPLE : **0**

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : **2.65**

TEST PROCEDURE	RESULT	SPECS
LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90		
METHOD **B** LIQUID LIMIT →	30	
ESTIMATED % RETAINED ON NO. 40 **68** PLASTIC LIMIT →	21	
SAMPLE AIR DRIED [X] YES [ ] NO PLASTICITY INDEX →	9	
MOISTURE CONTENT : AASHTO T265		
PORTION TESTED **FULL** % DRY WEIGHT →	24.0	
EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :		
[ ] EXPANSION [ ] COMPRESSION, % →		
MAXIMUM SWELL PRESSURE, KSF →		
SURCHARGE, KSF		
INITIAL WATER CONTENT, % DRY DENSITY, PCF		

TEST PROCEDURE	RESULT	SPECS
RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :		
GRADING 100 REV, % LOSS →		
GRADING 500 REV, % LOSS →		
SPECIFIC GRAVITY :		
MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C →		
pH DETERMINATION :		
pH →		
SOLUBLE SALTS :		
PPM →		
MINIMUM RESISTIVITY :		
OHM-CM →		

SOIL CLASSIFICATION : ASTM D2487
GROUP SYMBOL: **SP-SC**
NAME: **POORLY GRADED SAND WITH CLAY AND GRAVEL**

Comments :

Copies to : **CLIENT (1)**

REVIEWED BY

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

LABORATORY REPORT

Client **ANDERSON ENGINEERING COMPANY, INC.**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-13-12**
Job No. **3151JM098**
Event / Invoice No. **31520185-26** Lab No.
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **11-07-12**
Submitted By **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS REMOVAL & DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **VARIOUS**
Sample Source / Location **MW-204 SONIC**
Reference: **ASTM**
Special Instructions:

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **11-07-12**

TEST RESULTS

ELEVATION (FT)	MOISTURE CONTENT (%)	ATTERBERGS:	LL	PL	PI	ORGANIC CONTENT (%)
0-7'	7.9					
7-10.5'	9.7		29	19	10	
10.5-12'	9.4					
12-15'	14.4		29	19	10	
21-25.5'	16.6					

Comments: **SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATIONS**

Copies To: **CLIENT (2)**

REVIEWED BY 

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF AGGREGATES

Date of Report **12-13-12**
Job No. **3151JM098**
Event / Invoice No. **315200185-26** Lab No. **09811120**
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **11-07-12**
Submitted By **J. GISSEMAN** Date **11-14-12**

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Project **RICO INITIAL SOLIDS**
Location **RICO, COLORADO**
Contractor **FLARE CONSTRUCTION**
Arch. / Engr. **ANDERSON ENGINEERING**
Type / Use of Aggregate **VARIABLE**
Supplier / Source **BORINGS**
Sample Source / Location **MW-204 SONIC 0-7'**
Source / Location Desig. By **CLIENT** Date **11-07-12**
Special Instructions: **0981120-1**

TEST RESULTS

SIEVE ANALYSIS [X] ASTM C136 [ ] AASHTO T27

SIEVE SIZE U.S. - MM	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN. -100.0		
3 - 75.0		
2 - 50.0		
1 1/2 - 37.5		
1 1/4 - 31.5		
1 - 25.0	100	
3/4 - 19.0	72	
1/2 - 12.5	56	
3/8 - 9.5	44	
1/4 - 6.3	32	
NO. 4 - 4.75	26	
8 - 2.36	18	
10 - 2.00	16	
16 - 1.18	13	
30 - .600	10	
40 - .425	8.6	
50 - .300	7.2	
100 - .150	4.9	
FINER THAN NO. 200 [X] ASTM C117 [ ] AASHTO T11	3.0	

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
[ ] ASTM D4318 [ ] AASHTO T89 & T90

METHOD [ ] A [ ] B	RESULT	SPECIFICATION
LIQUID LIMIT		
PLASTIC LIMIT		
PLASTICITY INDEX		
SAMPLE AIR DRIED [ ] YES [ ] NO		

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES [ ] ASTM C40 [ ] AASHTO T21
ORGANIC PLATE NO. →

CARBONATES IN AGGREGATE
[ ] ARIZ 238 [ ] ASTM D3042 % →

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS [ ] ASTM C29 [ ] AASHTO T19 [ ] RODDING [ ] JIGGING [ ] LOOSE	FINE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
	COARSE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION FINE AGGREGATE [ ] ASTM C128 [ ] AASHTO T84 AGGREGATE DRIED [ ] YES [ ] NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
COARSE AGGREGATE [ ] ASTM C127 [ ] AASHTO T85 AGGREGATE DRIED [ ] YES [ ] NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
SAND EQUIVALENT VALUE [ ] ASTM D2419 [ ] AASHTO T176		% →		
RESISTANCE TO DEGRADATION SMALL COARSE AGGREGATE [ ] ASTM C131 [ ] AASHTO T96 GRADING		100 REV., % LOSS →		
		500 REV., % LOSS →		
LARGE COARSE AGGREGATE [ ] ASTM C535 GRADING		200 REV., % LOSS →		
		1000 REV., % LOSS →		
LIGHTWEIGHT PIECES [ ] ASTM C123 [ ] AASHTO T113		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES [ ] ASTM C142 [ ] AASHTO T112		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
FRACTURED FACES COARSE AGGREGATE BY WEIGHT [ ] ASTM D5821 [ ] FLH T507 [ ] FAA [ ]		ONE OR MORE FACES, % →		
		TWO OR MORE FACES, % →		
DURABILITY INDEX [ ] ASTM D3744 [ ] AASHTO T210 PROCEDURE: A [ ] COARSE B [ ] FINE C [ ] COARSE & FINE		D_c →		
		D_f →		
UNCOMPACTED VOID CONTENT [ ] ASTM C1252 [ ]		% →		
FLAT & ELONGATED PARTICLES [ ] ASTM D4791 [ ] DIMENSIONAL RATIO USED [ ] 1:2 [ ] 1:3 [ ] 1:5 [ ]		BY WEIGHT, % →		
		BY NUMBER, % →		

Comments:

Copies To: **CLIENT (2) - ELECTRONIC**

REVIEWED BY

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF AGGREGATES

Date of Report **12-13-12**

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Job No. **3151JM098**
Event / Invoice No. **315200185-26** Lab No. **09811120**
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **11-07-12**
Submitted By **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS**
Contractor **FLARE CONSTRUCTION**
Type / Use of Aggregate **VARIABLE**
Sample Source / Location **MW-204 SONIC 10.5-12'**
Special Instructions: **0981120-3**

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **11-07-12**

TEST RESULTS

SIEVE ANALYSIS [X] ASTM C136 [ ] AASHTO T27

SIEVE SIZE U.S. - MM	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN. -100.0		
3 - 75.0		
2 - 50.0		
1 1/2 - 37.5		
1 1/4 - 31.5		
1 - 25.0	100	
3/4 - 19.0	87	
1/2 - 12.5	68	
3/8 - 9.5	54	
1/4 - 6.3	41	
NO. 4 - 4.75	33	
8 - 2.36	22	
10 - 2.00	19	
16 - 1.18	15	
30 - .600	11	
40 - .425	8.9	
50 - .300	7.4	
100 - .150	4.8	

FINER THAN NO. 200
[X] ASTM C117
[ ] AASHTO T11
2.6

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
[ ] ASTM D4318 [ ] AASHTO T89 & T90
METHOD [ ] A [ ] B

	RESULT	SPECIFICATION
LIQUID LIMIT		
PLASTIC LIMIT		
PLASTICITY INDEX		

SAMPLE AIR DRIED [ ] YES [ ] NO

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES [ ] ASTM C40 [ ] AASHTO T21
ORGANIC PLATE NO. →

CARBONATES IN AGGREGATE
[ ] ARIZ 238 [ ] ASTM D3042 % →

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS [ ] ASTM C29 [ ] AASHTO T19 [ ] RODDING [ ] JIGGING [ ] LOOSE	FINE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
	COARSE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION FINE AGGREGATE [ ] ASTM C128 [ ] AASHTO T84 AGGREGATE DRIED [ ] YES [ ] NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
COARSE AGGREGATE [ ] ASTM C127 [ ] AASHTO T85 AGGREGATE DRIED [ ] YES [ ] NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
SAND EQUIVALENT VALUE [ ] ASTM D2419 [ ] AASHTO T176		% →		
RESISTANCE TO DEGRADATION SMALL COARSE AGGREGATE [ ] ASTM C131 [ ] AASHTO T96 GRADING		100 REV., % LOSS →		
		500 REV., % LOSS →		
LARGE COARSE AGGREGATE [ ] ASTM C535 GRADING		200 REV., % LOSS →		
		1000 REV., % LOSS →		
LIGHTWEIGHT PIECES [ ] ASTM C123 [ ] AASHTO T113		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES [ ] ASTM C142 [ ] AASHTO T112		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
FRACTURED FACES COARSE AGGREGATE BY WEIGHT [ ] ASTM D5821 [ ] FLH T507 [ ] FAA [ ]		ONE OR MORE FACES, % →		
		TWO OR MORE FACES, % →		
DURABILITY INDEX [ ] ASTM D3744 [ ] AASHTO T210 PROCEDURE: A [ ] COARSE B [ ] FINE C [ ] COARSE & FINE		D_c →		
		D_f →		
UNCOMPACTED VOID CONTENT [ ] ASTM C1252 [ ]		% →		
FLAT & ELONGATED PARTICLES [ ] ASTM D4791 [ ] DIMENSIONAL RATIO USED [ ] 1:2 [ ] 1:3 [ ] 1:5 [ ]		BY WEIGHT, % →		
		BY NUMBER, % →		

Comments:

Copies To: **CLIENT (2) - ELECTRONIC**

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF AGGREGATES

Date of Report **12-13-12**

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Job No. **3151JM098**
Event / Invoice No. **315200185-26** Lab No. **09811120**
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **11-07-12**
Submitted By **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS**
Contractor **FLARE CONSTRUCTION**
Type / Use of Aggregate **VARIABLE**
Sample Source / Location **MW-204 SONIC 21-25.5'**
Special Instructions: **0981120-5**

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **11-07-12**

TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27

SIEVE SIZE U.S. - MM	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN. -100.0		
3 - 75.0		
2 - 50.0		
1 1/2 - 37.5		
1 1/4 - 31.5		
1 - 25.0	100	
3/4 - 19.0	69	
1/2 - 12.5	59	
3/8 - 9.5	56	
1/4 - 6.3	49	
NO. 4 - 4.75	46	
8 - 2.36	37	
10 - 2.00	35	
16 - 1.18	29	
30 - .600	24	
40 - .425	22	
50 - .300	18	
100 - .150	12	
FINER THAN NO. 200 ☒ ASTM C117 ☐ AASHTO T11	7.6	

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90

METHOD ☐ A ☐ B	RESULT	SPECIFICATION
LIQUID LIMIT		
PLASTIC LIMIT		
PLASTICITY INDEX		
SAMPLE AIR DRIED ☐ YES ☐ NO		

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES ☐ ASTM C40 ☐ AASHTO T21
ORGANIC PLATE NO. →

CARBONATES IN AGGREGATE
☐ ARIZ 238 ☐ ASTM D3042 % →

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS ☐ ASTM C29 ☐ AASHTO T19 ☐ RODDING ☐ JIGGING ☐ LOOSE	FINE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
	COARSE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 AGGREGATE DRIED ☐ YES ☐ NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85 AGGREGATE DRIED ☐ YES ☐ NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176		% →		
RESISTANCE TO DEGRADATION SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96 GRADING		100 REV., % LOSS →		
		500 REV., % LOSS →		
LARGE COARSE AGGREGATE ☐ ASTM C535 GRADING		200 REV., % LOSS →		
		1000 REV., % LOSS →		
LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
FRACTURED FACES COARSE AGGREGATE BY WEIGHT ☐ ASTM D5821 ☐ FLH T507 ☐ FAA ☐		ONE OR MORE FACES, % →		
		TWO OR MORE FACES, % →		
DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210 PROCEDURE: A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE		D_c →		
		D_f →		
UNCOMPACTED VOID CONTENT ☐ ASTM C1252 ☐		% →		
FLAT & ELONGATED PARTICLES ☐ ASTM D4791 ☐ DIMENSIONAL RATIO USED ☐ 1:2 ☐ 1:3 ☐ 1:5 ☐		BY WEIGHT, % →		
		BY NUMBER, % →		

Comments:

Copies To: **CLIENT (2) - ELECTRONIC**

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-14-12**
Job No. **3151JM098**
Event / Invoice No. **31520185-26** Lab No. **0981120-1**
Authorized by **CHRIS SANCHEZ** Date **10-22-12**
Sampled by **CLIENT** Date **11-07-12**
Submitted by **J. GISSEMAN** Date **11-14-12**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **VARIABLE**
Sample Source / Location **MW-204, 0-25.5'**
Testing Authorized :
Special Instructions :

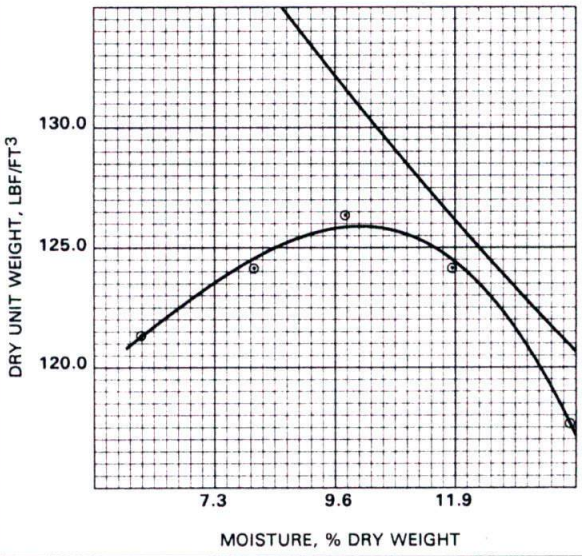
Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **11-14-12**

TEST RESULTS

SIEVE ANALYSIS :
FINER THAN NO. 200 :

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: [X] WET [ ] DRY
RAMMER USED:
[X] 2 IN. CIRCULAR FACE [ ] OTHER
[ ] MECHANICAL [X] MANUAL

PROJECT PROCTOR ID: **63**
MAXIMUM DENSITY, LBF/FT3 → **125.9**
OPTIMUM MOISTURE CONTENT, % → **9.9**

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : **2.65**
ASSUMED ABSORPTION, % : **1.0**
% OVERSIZE IN LAB SAMPLE : **20**

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : **2.65**

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT3 **132.2**
CORR. OPTIMUM MOISTURE, % **8.1**

TEST PROCEDURE	RESULT	SPECS	TEST PROCEDURE	RESULT	SPECS
LIQUID & PLASTIC PROPERTIES : LIQUID LIMIT → ESTIMATED % RETAINED ON NO. 40 PLASTIC LIMIT → SAMPLE AIR DRIED [ ] YES [ ] NO PLASTICITY INDEX →			**RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** GRADING 100 REV, % LOSS → GRADING 500 REV, % LOSS →		
MOISTURE CONTENT : PORTION TESTED % DRY WEIGHT →			**SPECIFIC GRAVITY :** MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C →		
EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL : [ ] EXPANSION [ ] COMPRESSION, % → MAXIMUM SWELL PRESSURE, KSF → SURCHARGE, KSF INITIAL WATER CONTENT, % DRY DENSITY, PCF			**pH DETERMINATION :** pH →		
			SOLUBLE SALTS : PPM →		
			MINIMUM RESISTIVITY : OHM-CM →		

SOIL CLASSIFICATION : GROUP SYMBOL:
NAME:

Comments :

Copies to : **CLIENT (1)**

REVIEWED BY

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

LABORATORY REPORT

Date of Report **12-08-12**

Client **ANDERSON ENGINEERING COMPANY, INC.**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Job No. **3151JM098**
Event / Invoice No. **31520185-15** Lab No.
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **10-29-12**
Submitted By **R. BORREGO** Date **11-07-12**

Project **RICO INITIAL SOLIDS REMOVAL & DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **VARIOUS**
Sample Source / Location **SSR-103**
Reference: **ASTM**
Special Instructions:

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **10-29-12**

TEST RESULTS

ELEVATION (FT)	MOISTURE CONTENT (%)	ATTERBERGS:	LL	PL	PI	ORGANIC CONTENT (%)
0-5' BAGGIE	11.3					
10-13' BAGGIE	12.3					
25-30' BAGGIE	7.2					
5-35' BULK	2.4		28	20	8	
60-65' BAGGIE	10.8					
37-70' BULK	6.5					
80-86' BAGGIE	11.1					
70-87' BULK	8.8					

Comments: **SEE ADDITIONAL PHYSICAL PROPERTIES REPORTS FOR GRADATIONS**

Copies To: **CLIENT (2)**

REVIEWED BY

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-10-12**
Job No. **3151JM098**
Event / Invoice No. **315200185-15** Lab No. **0981109-**
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **10-29-12**
Submitted By **R. BORREGO** Date **11-07-12**

Project **RICO INITIAL SOLIDS**
Contractor **FLARE CONSTRUCTION**
Type / Use of Aggregate **VARIABLE**
Sample Source / Location **SSR-103 BULK 5-35'**
Special Instructions: **0981109-4**

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **10-29-12**

TEST RESULTS

SIEVE ANALYSIS ☒ ASTM C136 ☐ AASHTO T27

SIEVE SIZE U.S. - MM	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN. - 100.0		
3 - 75.0		
2 - 50.0		
1 1/2 - 37.5		
1 1/4 - 31.5		
1 - 25.0	100	
3/4 - 19.0	84	
1/2 - 12.5	71	
3/8 - 9.5	67	
1/4 - 6.3	61	
NO. 4 - 4.75	57	
8 - 2.36	50	
10 - 2.00	48	
16 - 1.18	44	
30 - .600	39	
40 - .425	37	
50 - .300	34	
100 - .150	26	

FINER THAN NO. 200
☒ ASTM C117 ☐ AASHTO T11 — **19.9**

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD ☐ A ☐ B

	RESULT	SPECIFICATION
LIQUID LIMIT		
PLASTIC LIMIT		
PLASTICITY INDEX		

SAMPLE AIR DRIED ☐ YES ☐ NO

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES ☐ ASTM C40 ☐ AASHTO T21
ORGANIC PLATE NO. →

CARBONATES IN AGGREGATE
☐ ARIZ 238 ☐ ASTM D3042 % →

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS ☐ ASTM C29 ☐ AASHTO T19 ☐ RODDING ☐ JIGGING ☐ LOOSE	FINE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
	COARSE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 AGGREGATE DRIED ☐ YES ☐ NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
COARSE AGGREGATE ☐ ASTM C127 ☐ AASHTO T85 AGGREGATE DRIED ☐ YES ☐ NO		BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176		% →		
RESISTANCE TO DEGRADATION SMALL COARSE AGGREGATE ☐ ASTM C131 ☐ AASHTO T96 GRADING		100 REV., % LOSS →		
		500 REV., % LOSS →		
LARGE COARSE AGGREGATE ☐ ASTM C535 GRADING		200 REV., % LOSS →		
		1000 REV., % LOSS →		
LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
FRACTURED FACES COARSE AGGREGATE BY WEIGHT ☐ ASTM D5821 ☐ FLH T507 ☐ FAA ☐		ONE OR MORE FACES, % →		
		TWO OR MORE FACES, % →		
DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210 PROCEDURE: A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE		D_c →		
		D_f →		
UNCOMPACTED VOID CONTENT ☐ ASTM C1252 ☐		% →		
FLAT & ELONGATED PARTICLES ☐ ASTM D4791 ☐ DIMENSIONAL RATIO USED ☐ 1:2 ☐ 1:3 ☐ 1:5 ☐		BY WEIGHT, % →		
		BY NUMBER, % →		

Comments:

Copies To: **CLIENT (2) - ELECTRONIC**

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-10-12**
Job No. **3151JM098**
Event / Invoice No. **315200185-15** Lab No. **0981109-**
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **10-29-12**
Submitted By **R. BORREGO** Date **11-07-12**

Project **RICO INITIAL SOLIDS**
Contractor **FLARE CONSTRUCTION**
Type / Use of Aggregate **VARIABLE**
Sample Source / Location **SSR-103 BULK 37-70'**
Special Instructions: **0981109-6**

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **10-29-12**

TEST RESULTS

SIEVE ANALYSIS [X] ASTM C136 [ ] AASHTO T27

SIEVE SIZE U.S. - MM	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN. -100.0		
3 - 75.0		
2 - 50.0		
1 1/2 - 37.5		
1 1/4 - 31.5		
1 - 25.0	100	
3/4 - 19.0	92	
1/2 - 12.5	88	
3/8 - 9.5	83	
1/4 - 6.3	75	
NO. 4 - 4.75	71	
8 - 2.36	61	
10 - 2.00	60	
16 - 1.18	54	
30 - .600	49	
40 - .425	45	
50 - .300	43	
100 - .150	36	
FINER THAN NO. 200 [X] ASTM C117 [ ] AASHTO T11	29.0	

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
[ ] ASTM D4318 [ ] AASHTO T89 & T90
METHOD [ ] A [ ] B

	RESULT	SPECIFICATION
LIQUID LIMIT		
PLASTIC LIMIT		
PLASTICITY INDEX		

SAMPLE AIR DRIED [ ] YES [ ] NO

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES [ ] ASTM C40 [ ] AASHTO T21
ORGANIC PLATE NO. →

CARBONATES IN AGGREGATE
[ ] ARIZ 238 [ ] ASTM D3042 % →

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS [ ] ASTM C29 [ ] AASHTO T19 [ ] RODDING [ ] JIGGING [ ] LOOSE	FINE AGGREGATE	UNIT WEIGHT, PCF → VOIDS, % →		
	COARSE AGGREGATE	UNIT WEIGHT, PCF → VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION	FINE AGGREGATE [ ] ASTM C128 [ ] AASHTO T84 AGGREGATE DRIED [ ] YES [ ] NO	BULK SPECIFIC GRAVITY → BULK SPECIFIC GRAVITY (SSD) → APPARENT SPECIFIC GRAVITY → ABSORPTION, % →		
	COARSE AGGREGATE [ ] ASTM C127 [ ] AASHTO T85 AGGREGATE DRIED [ ] YES [ ] NO	BULK SPECIFIC GRAVITY → BULK SPECIFIC GRAVITY (SSD) → APPARENT SPECIFIC GRAVITY → ABSORPTION, % →		
SAND EQUIVALENT VALUE [ ] ASTM D2419 [ ] AASHTO T176		% →		
RESISTANCE TO DEGRADATION	SMALL COARSE AGGREGATE [ ] ASTM C131 [ ] AASHTO T96 GRADING	100 REV., % LOSS → 500 REV., % LOSS →		
	LARGE COARSE AGGREGATE [ ] ASTM C535 GRADING	200 REV., % LOSS → 1000 REV., % LOSS →		
LIGHTWEIGHT PIECES [ ] ASTM C123 [ ] AASHTO T113		FINE AGGREGATE, % → COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES [ ] ASTM C142 [ ] AASHTO T112		FINE AGGREGATE, % → COARSE AGGREGATE, % →		
FRACTURED FACES [ ] ASTM D5821 [ ] FLH T507 [ ] FAA [ ]	COARSE AGGREGATE BY WEIGHT	ONE OR MORE FACES, % → TWO OR MORE FACES, % →		
DURABILITY INDEX [ ] ASTM D3744 [ ] AASHTO T210 PROCEDURE: A [ ] COARSE B [ ] FINE C [ ] COARSE & FINE		D_c → D_f →		
UNCOMPACTED VOID CONTENT [ ] ASTM C1252 [ ]		% →		
FLAT & ELONGATED PARTICLES [ ] ASTM D4791 [ ] DIMENSIONAL RATIO USED [ ] 1:2 [ ] 1:3 [ ] 1:5 [ ]		BY WEIGHT, % → BY NUMBER, % →		

Comments:

Copies To: **CLIENT (2) - ELECTRONIC**

THE SERVICES REFERRED TO HEREIN WERE PERFORMED IN ACCORDANCE WITH THE STANDARD OF CARE PRACTICED LOCALLY FOR THE REFERENCED METHOD(S) AND RELATE ONLY TO THE CONDITION(S) OR SAMPLE(S) TESTED AS STATED HEREIN. WESTERN TECHNOLOGIES INC. MAKES NO OTHER WARRANTY OR REPRESENTATION, EXPRESSED OR IMPLIED, AND HAS NOT CONFIRMED INFORMATION INCLUDING SOURCE OF MATERIALS SUBMITTED BY OTHERS.

REVIEWED BY

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-10-12**
Job No. **3151JM098**
Event / Invoice No. **315200185-15** Lab No. **0981109-**
Authorized By **C. SANCHEZ** Date **10-22-12**
Sampled By **CLIENT** Date **10-29-12**
Submitted By **R. BORREGO** Date **11-07-12**

Project **RICO INITIAL SOLIDS**
Contractor **FLARE CONSTRUCTION**
Type / Use of Aggregate **VARIABLE**
Sample Source / Location **SSR-103 BULK 70-87'**
Special Instructions: **0981109-8**

Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **BORINGS**
Source / Location Desig. By **CLIENT** Date **10-29-12**

TEST RESULTS

SIEVE ANALYSIS [X] ASTM C136 [ ] AASHTO T27

SIEVE SIZE U.S. - MM	ACCUMULATIVE % PASSING	SPECIFICATION
4 IN. -100.0		
3 - 75.0		
2 - 50.0		
1 1/2 - 37.5		
1 1/4 - 31.5		
1 - 25.0		
3/4 - 19.0	100	
1/2 - 12.5	97	
3/8 - 9.5	94	
1/4 - 6.3	88	
NO. 4 - 4.75	83	
8 - 2.36	73	
10 - 2.00	71	
16 - 1.18	64	
30 - .600	57	
40 - .425	54	
50 - .300	50	
100 - .150	42	

FINER THAN NO. 200
[X] ASTM C117 [ ] AASHTO T11 — 35.1

FINENESS MODULUS, ASTM C125 →

LIQUID & PLASTIC PROPERTIES
[ ] ASTM D4318 [ ] AASHTO T89 & T90
METHOD [ ] A [ ] B

	RESULT	SPECIFICATION
LIQUID LIMIT		
PLASTIC LIMIT		
PLASTICITY INDEX		

SAMPLE AIR DRIED [ ] YES [ ] NO

CLEANNESS VALUE CA227 →

ORGANIC IMPURITIES [ ] ASTM C40 [ ] AASHTO T21
ORGANIC PLATE NO. →

CARBONATES IN AGGREGATE
[ ] ARIZ 238 [ ] ASTM D3042 % →

PHYSICAL PROPERTIES			TEST RESULTS	SPECIFICATION
UNIT WEIGHT & VOIDS [ ] ASTM C29 [ ] AASHTO T19 [ ] RODDING [ ] JIGGING [ ] LOOSE	FINE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
	COARSE AGGREGATE	UNIT WEIGHT, PCF →		
		VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION	FINE AGGREGATE [ ] ASTM C128 [ ] AASHTO T84 AGGREGATE DRIED [ ] YES [ ] NO	BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
	COARSE AGGREGATE [ ] ASTM C127 [ ] AASHTO T85 AGGREGATE DRIED [ ] YES [ ] NO	BULK SPECIFIC GRAVITY →		
		BULK SPECIFIC GRAVITY (SSD) →		
		APPARENT SPECIFIC GRAVITY →		
		ABSORPTION, % →		
SAND EQUIVALENT VALUE [ ] ASTM D2419 [ ] AASHTO T176		% →		
RESISTANCE TO DEGRADATION SMALL COARSE AGGREGATE [ ] ASTM C131 [ ] AASHTO T96 GRADING		100 REV., % LOSS →		
		500 REV., % LOSS →		
LARGE COARSE AGGREGATE [ ] ASTM C535 GRADING		200 REV., % LOSS →		
		1000 REV., % LOSS →		
LIGHTWEIGHT PIECES [ ] ASTM C123 [ ] AASHTO T113		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES [ ] ASTM C142 [ ] AASHTO T112		FINE AGGREGATE, % →		
		COARSE AGGREGATE, % →		
FRACTURED FACES COARSE AGGREGATE BY WEIGHT [ ] ASTM D5821 [ ] FLH T507 [ ] FAA [ ]		ONE OR MORE FACES, % →		
		TWO OR MORE FACES, % →		
DURABILITY INDEX [ ] ASTM D3744 [ ] AASHTO T210 PROCEDURE: A [ ] COARSE B [ ] FINE C [ ] COARSE & FINE		D_c →		
		D_f →		
UNCOMPACTED VOID CONTENT [ ] ASTM C1252 [ ]		% →		
FLAT & ELONGATED PARTICLES [ ] ASTM D4791 [ ] DIMENSIONAL RATIO USED [ ] 1:2 [ ] 1:3 [ ] 1:5 [ ]		BY WEIGHT, % →		
		BY NUMBER, % →		

Comments:

Copies To: **CLIENT (2) - ELECTRONIC**

REVIEWED BY _____

Soils Testing

2. Samples from Test Pits

TP-2004A
TP-2004B
TP2011-AT1
TP2011-AT2
TP2011-AT3
TP2011-AT4
TP2011-AT5
TP2011-AT6
TP2011-17
TP-17
TP-18
TP-22
TP-2013XX
TP-2013YY
TP-2013Z

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-09-11**
Job No. **3151JM098**
Event / Invoice No. **31510186-106** Lab No. **0981104-1**
Authorized by **CHRIS SANCHEZ** Date **10-21-11**
Sampled by **CLIENT** Date **10-21-11**
Submitted by **D. SENJEM** Date **10-31-11**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **4" MINUS SILTY CLAYEY SAND W/GRAV.**
Sample Source / Location **TP-1 (TP2011-AT1)**
Testing Authorized :
Special Instructions :

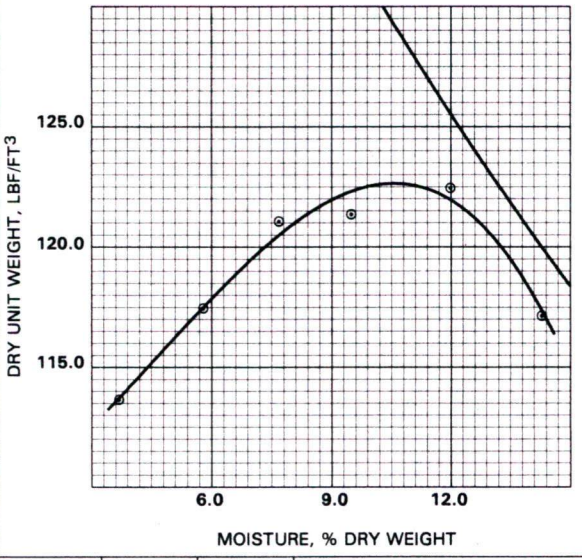
Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **EXISTING SUBGRADE**
Source / Location Desig. By **CLIENT** Date **10-21-11**

TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION
6		
5		
4	100	
3	96	
2	96	
1 1/2	94	
1	89	
3/4	86	
1/2	81	
3/8	77	
1/4	70	
No.4	68	
8	55	
10	55	
16	48	
30	41	
40	38	
50	35	
100	28	
200	23	

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: [X] WET [ ] DRY
RAMMER USED:
[X] 2 IN. CIRCULAR FACE [ ] OTHER
[ ] MECHANICAL [X] MANUAL

PROJECT PROCTOR ID: **42**
MAXIMUM DENSITY, LBF/FT3 → **122.6**
OPTIMUM MOISTURE CONTENT, % → **10.5**

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : **2.65**
ASSUMED ABSORPTION, % : **1.0**
% OVERSIZE IN LAB SAMPLE : **14**

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : **2.65**

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT3 **127.2**
CORR. OPTIMUM MOISTURE, % **9.2**

TEST PROCEDURE	RESULT	SPECS	TEST PROCEDURE	RESULT	SPECS
LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90 METHOD **B** LIQUID LIMIT → ESTIMATED % RETAINED ON NO. 40 **62** PLASTIC LIMIT → SAMPLE AIR DRIED [X] YES [ ] NO PLASTICITY INDEX →	**24** **18** **6**		**RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** GRADING 100 REV, % LOSS → GRADING 500 REV, % LOSS →		
MOISTURE CONTENT : PORTION TESTED % DRY WEIGHT →			**SPECIFIC GRAVITY :** MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C →		
EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL : [ ] EXPANSION [ ] COMPRESSION, % → MAXIMUM SWELL PRESSURE, KSF → SURCHARGE, KSF INITIAL WATER CONTENT, % DRY DENSITY, PCF			**pH DETERMINATION :** pH → **SOLUBLE SALTS :** PPM → **MINIMUM RESISTIVITY :** OHM-CM →		

SOIL CLASSIFICATION : ASTM D2487
GROUP SYMBOL: **SC-SM**
NAME: **SILTY, CLAYEY SAND WITH GRAVEL**

Comments :

Copies to : **CLIENT (1)**

REVIEWED BY

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-07-11**
Job No. **3151JM098**
Event / Invoice No. **31510186-95** Lab No. **0981129-2**
Authorized by **CHRIS SANCHEZ** Date **10-21-11**
Sampled by **CLIENT** Date **10-21-11**
Submitted by **D. SENJEM** Date **10-31-11**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **3" MINUS SILTY GRAVEL WITH SAND**
Sample Source / Location **TP-2 (TP2011-AT2)**
Testing Authorized :
Special Instructions :

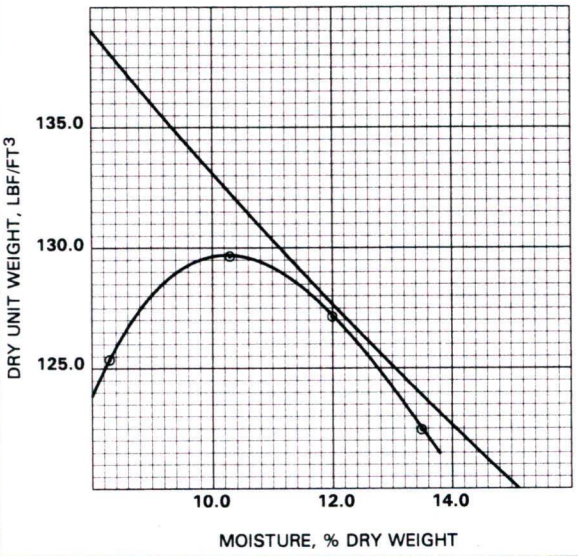
Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **EXISTING SUBGRADE**
Source / Location Desig. By **CLIENT** Date **10-21-11**

TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 : ASTM C117

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION
6		
5		
4		
3	100	
2	90	
1 1/2	84	
1	77	
3/4	72	
1/2	66	
3/8	64	
1/4	58	
No.4	54	
8	45	
10	42	
16	37	
30	31	
40	28	
50	25	
100	21	
200	17	

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: [X] WET [ ] DRY
RAMMER USED:
[X] 2 IN. CIRCULAR FACE [ ] OTHER
[ ] MECHANICAL [X] MANUAL

PROJECT PROCTOR ID: **38**
MAXIMUM DENSITY, LBF/FT3 → **129.7**
OPTIMUM MOISTURE CONTENT, % → **10.2**

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : **2.65**
ASSUMED ABSORPTION, % : **1.0**
% OVERSIZE IN LAB SAMPLE : **28**

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : **2.71**

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT3 **138.0**
CORR. OPTIMUM MOISTURE, % **7.6**

TEST PROCEDURE	RESULT	SPECS	TEST PROCEDURE	RESULT	SPECS
LIQUID & PLASTIC PROPERTIES : ASTM D4318 METHOD **B** LIQUID LIMIT → ESTIMATED % RETAINED ON NO. 40 **72** PLASTIC LIMIT → SAMPLE AIR DRIED [X] YES [ ] NO PLASTICITY INDEX →	21 0 NP		**RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** GRADING 100 REV, % LOSS → GRADING 500 REV, % LOSS →		
MOISTURE CONTENT : PORTION TESTED % DRY WEIGHT →			**SPECIFIC GRAVITY :** MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C →		
EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL : [ ] EXPANSION [ ] COMPRESSION, % → MAXIMUM SWELL PRESSURE, KSF → SURCHARGE, KSF INITIAL WATER CONTENT, % DRY DENSITY, PCF			**pH DETERMINATION :** pH → **SOLUBLE SALTS :** PPM → **MINIMUM RESISTIVITY :** OHM-CM →		

SOIL CLASSIFICATION : ASTM D2487
GROUP SYMBOL: **GM**
NAME: **SILTY GRAVEL WITH SAND**

Comments :

Copies to : **CLIENT (1)**

REVIEWED BY _____

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-07-11**
Job No. **3151JM098**
Event / Invoice No. **31510186-96** Lab No. **0981104-3**
Authorized by **CHRIS SANCHEZ** Date **10-21-11**
Sampled by **CLIENT** Date **10-21-11**
Submitted by **D. SENJEM** Date **10-31-11**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **3' MINUS SILTY GRAVEL WITH SAND**
Sample Source / Location **TP-3 (TP2011-AT3)**
Testing Authorized :
Special Instructions :

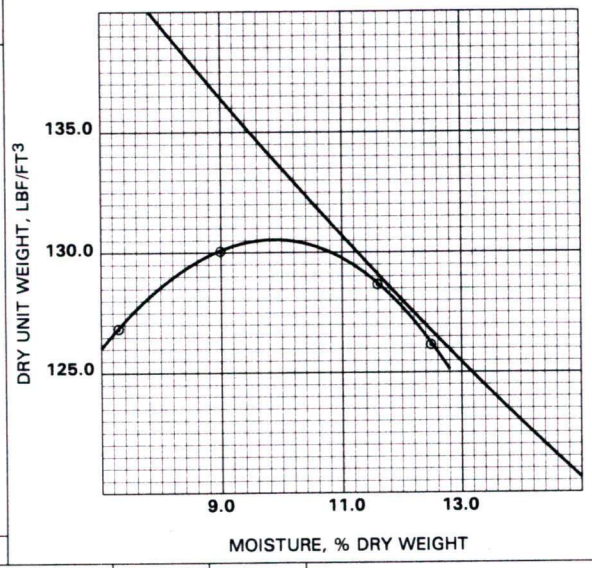
Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **EXISTING SUBGRADE**
Source / Location Desig. By **CLIENT** Date **10-21-11**

TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION
6		
5		
4		
3	100	
2	98	
1 1/2	95	
1	88	
3/4	82	
1/2	81	
3/8	65	
1/4	56	
No.4	51	
8	39	
10	38	
16	31	
30	26	
40	24	
50	21	
100	17	
200	13	

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD **C**



SAMPLE PREPARATION: [X] WET [ ] DRY
RAMMER USED:
[X] 2 IN. CIRCULAR FACE [ ] OTHER
[ ] MECHANICAL [X] MANUAL

PROJECT PROCTOR ID: **12**
MAXIMUM DENSITY, LBF/FT3 → **130.5**
OPTIMUM MOISTURE CONTENT, % → **9.8**

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : **2.65**
ASSUMED ABSORPTION, % : **1.0**
% OVERSIZE IN LAB SAMPLE : **18**

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : **2.72**

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT3 **135.6**
CORR. OPTIMUM MOISTURE, % **8.2**

TEST PROCEDURE	RESULT	SPECS	TEST PROCEDURE	RESULT	SPECS
LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90 METHOD **B** LIQUID LIMIT → ESTIMATED % RETAINED ON NO. 40 **77** PLASTIC LIMIT → SAMPLE AIR DRIED [X] YES [ ] NO PLASTICITY INDEX →	**NP**		**RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :** GRADING 100 REV, % LOSS → GRADING 500 REV, % LOSS →		
MOISTURE CONTENT : PORTION TESTED % DRY WEIGHT →			**SPECIFIC GRAVITY :** MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C →		
EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL : [ ] EXPANSION [ ] COMPRESSION, % → MAXIMUM SWELL PRESSURE, KSF → SURCHARGE, KSF INITIAL WATER CONTENT, % DRY DENSITY, PCF			**pH DETERMINATION :** pH → **SOLUBLE SALTS :** PPM → **MINIMUM RESISTIVITY :** OHM-CM →		

SOIL CLASSIFICATION : ASTM D2487
GROUP SYMBOL: **GM**
NAME: **SILTY GRAVEL WITH SAND**

Comments :

Copies to : **CLIENT (1)**

REVIEWED BY

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-07-11**
Job No. **3151JM098**
Event / Invoice No. **31510186-97** Lab No. **0981104-4**
Authorized by **CHRIS SANCHEZ** Date **10-21-11**
Sampled by **CLIENT** Date **10-21-11**
Submitted by **D. SENJEM** Date **10-31-11**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **4' MINUS SILTY GRAVEL WITH SAND**
Sample Source / Location **TP-5 (TP2011-AT5)**
Testing Authorized :
Special Instructions :

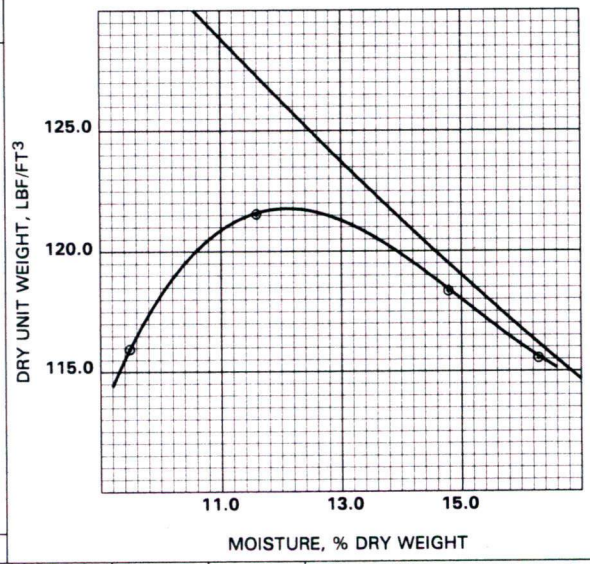
Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **EXISTING GROUND**
Source / Location Desig. By **CLIENT** Date **10-21-11**

TEST RESULTS

SIEVE ANALYSIS : ASTM C136
FINER THAN NO. 200 : ASTM C117

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION
6		
5		
4	100	
3	89	
2	86	
1 1/2	81	
1	72	
3/4	67	
1/2	62	
3/8	58	
1/4	53	
No.4	50	
8	44	
10	43	
16	39	
30	35	
40	32	
50	30	
100	25	
200	19	

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: [X] WET [ ] DRY
RAMMER USED:
[X] 2 IN. CIRCULAR FACE [ ] OTHER
[ ] MECHANICAL [X] MANUAL

PROJECT PROCTOR ID: **16**
MAXIMUM DENSITY, LBF/FT3 → **121.8**
OPTIMUM MOISTURE CONTENT, % → **12.1**

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : **2.65**
ASSUMED ABSORPTION, % : **1.0**
% OVERSIZE IN LAB SAMPLE : **33**

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : **2.67**

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT3 **133.4**
CORR. OPTIMUM MOISTURE, % **8.4**

TEST PROCEDURE	RESULT	SPECS
LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90		
METHOD **B** LIQUID LIMIT →	35	
ESTIMATED % RETAINED ON NO. 40 **68** PLASTIC LIMIT →	27	
SAMPLE AIR DRIED [X] YES [ ] NO PLASTICITY INDEX →	8	
MOISTURE CONTENT :		
PORTION TESTED % DRY WEIGHT →		
EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :		
[ ] EXPANSION [ ] COMPRESSION, % →		
MAXIMUM SWELL PRESSURE, KSF →		
SURCHARGE, KSF		
INITIAL WATER CONTENT, % DRY DENSITY, PCF		

TEST PROCEDURE	RESULT	SPECS
RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :		
GRADING 100 REV, % LOSS →		
GRADING 500 REV, % LOSS →		
SPECIFIC GRAVITY :		
MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C →		
pH DETERMINATION :		
pH →		
SOLUBLE SALTS :		
PPM →		
MINIMUM RESISTIVITY :		
OHM-CM →		

SOIL CLASSIFICATION : ASTM D2487
GROUP SYMBOL: **GM**
NAME: **SILTY GRAVEL WITH SAND**

Comments :

Copies to : **CLIENT (1)**

REVIEWED BY

Western Technologies Inc.
The Quality People
Since 1955

278 Sawyer Drive, No. 2
Durango, Colorado 81302
(970) 375-9033 • fax: 375-9034

PHYSICAL PROPERTIES OF SOILS & AGGREGATES

Client **ANDERSON ENGINEERING**
977 WEST 2100 SOUTH
SALT LAKE CITY, UT 84119

Date of Report **12-09-11**
Job No. **3151JM098**
Event / Invoice No. **31510186-107** Lab No. **0981104-5**
Authorized by **CHRIS SANCHEZ** Date **10-21-11**
Sampled by **CLIENT** Date **10-21-11**
Submitted by **D. SENJEM** Date **10-31-11**

Project **RICO INITIAL SOLIDS REMOVAL AND DRYING**
Contractor **FLARE CONSTRUCTION**
Type / Use of Material **3" MINUS CLAYEY GRAVEL WITH SAND**
Sample Source / Location **TP-6 (TP2011-AT6)**
Testing Authorized :
Special Instructions :

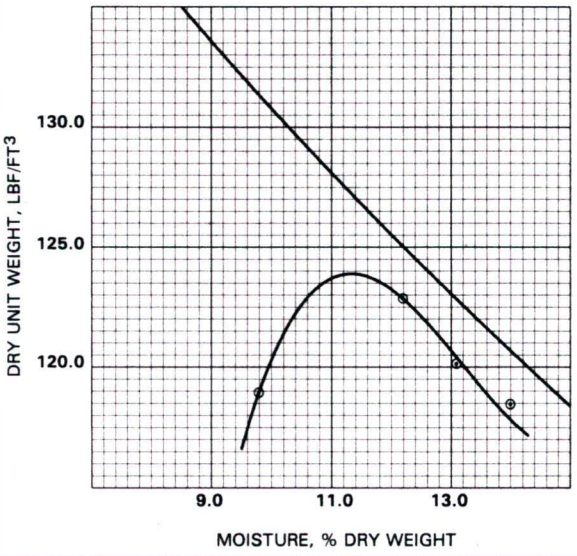
Location **RICO, COLORADO**
Arch. / Engr. **ANDERSON ENGINEERING**
Supplier / Source **EXISTING SUBGRADE**
Source / Location Desig. By **CLIENT** Date **10-21-11**

TEST RESULTS

SIEVE ANALYSIS : CP-31
FINER THAN NO. 200 : ASTM C117

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION
6		
5		
4	100	
3	98	
2	94	
1 1/2	91	
1	85	
3/4	81	
1/2	74	
3/8	71	
1/4	64	
No.4	60	
8	50	
10	49	
16	42	
30	37	
40	34	
50	32	
100	27	
200	22	

LABORATORY COMPACTION CHARACTERISTICS : ASTM D698 METHOD C



SAMPLE PREPARATION: [X] WET [ ] DRY
RAMMER USED:
[X] 2 IN. CIRCULAR FACE [ ] OTHER
[ ] MECHANICAL [X] MANUAL

PROJECT PROCTOR ID: **41**
MAXIMUM DENSITY, LBF/FT3 → **123.9**
OPTIMUM MOISTURE CONTENT, % → **11.3**

OVERSIZE AGGREGATE :
ASSUMED BULK SPECIFIC GRAVITY : **2.65**
ASSUMED ABSORPTION, % : **1.0**
% OVERSIZE IN LAB SAMPLE : **19**

ASSUMED SPECIFIC GRAVITY IN ZERO AIR VOID CURVE : **2.65**

CORRECTION OF MAXIMUM UNIT WEIGHT & OPTIMUM MOISTURE CONTENT FOR OVERSIZE PARTICLES : ASTM D4718

CORR. MAXIMUM DENSITY, LBF/FT3 **130.1**
CORR. OPTIMUM MOISTURE, % **9.3**

TEST PROCEDURE	RESULT	SPECS
LIQUID & PLASTIC PROPERTIES : AASHTO T89, 90		
METHOD **B** LIQUID LIMIT →	32	
ESTIMATED % RETAINED ON NO. 40 **66** PLASTIC LIMIT →	21	
SAMPLE AIR DRIED [X] YES [ ] NO PLASTICITY INDEX →	11	
MOISTURE CONTENT :		
PORTION TESTED % DRY WEIGHT →		
EXPANSION / COMPRESSION PROPERTIES OF COHESIVE SOIL :		
[ ] EXPANSION [ ] COMPRESSION, % →		
MAXIMUM SWELL PRESSURE, KSF →		
SURCHARGE, KSF		
INITIAL WATER CONTENT, % DRY DENSITY, PCF		

TEST PROCEDURE	RESULT	SPECS
RESISTANCE TO DEGRADATION OF SMALL-SIZE COARSE AGGREGATES BY ABRASION :		
GRADING 100 REV, % LOSS →		
GRADING 500 REV, % LOSS →		
SPECIFIC GRAVITY :		
MAX. PARTICLE SIZE, IN. SPECIFIC GRAVITY @ 20°C →		
pH DETERMINATION :		
pH →		
SOLUBLE SALTS :		
PPM →		
MINIMUM RESISTIVITY :		
OHM-CM →		

SOIL CLASSIFICATION : ASTM D2487
GROUP SYMBOL: **GC**
NAME: **CLAYEY GRAVEL WITH SAND**

Comments :

Copies to : **CLIENT (1)**

REVIEWED BY